BOSTON
MEDICAL LIBRARY
8 THE FENWAY

TRANSACTIONS

OF THE

Fifteenth International Congress on Hygiene and Demography

WASHINGTON

September 23–28, 1912

PUBLISHED BY THE COMMITTEE ON ORGANIZATION

EDITED BY THE SECRETARY GENERAL

VOLUME III

PART I.—PROCEEDINGS OF SECTION III

Hygiene of Infancy and Childhood: School Hygiene

WASHINGTON
GOVERNMENT PRINTING OFFICE
1913

32
B
481
1912
v. 3
copy 1

BOSTON MEDICAL
APR 15 1914
LIBRARY

CATALOGUED
APR 15 1914
J. F. B.

OFFICERS OF SECTION III.

PRESIDENT.

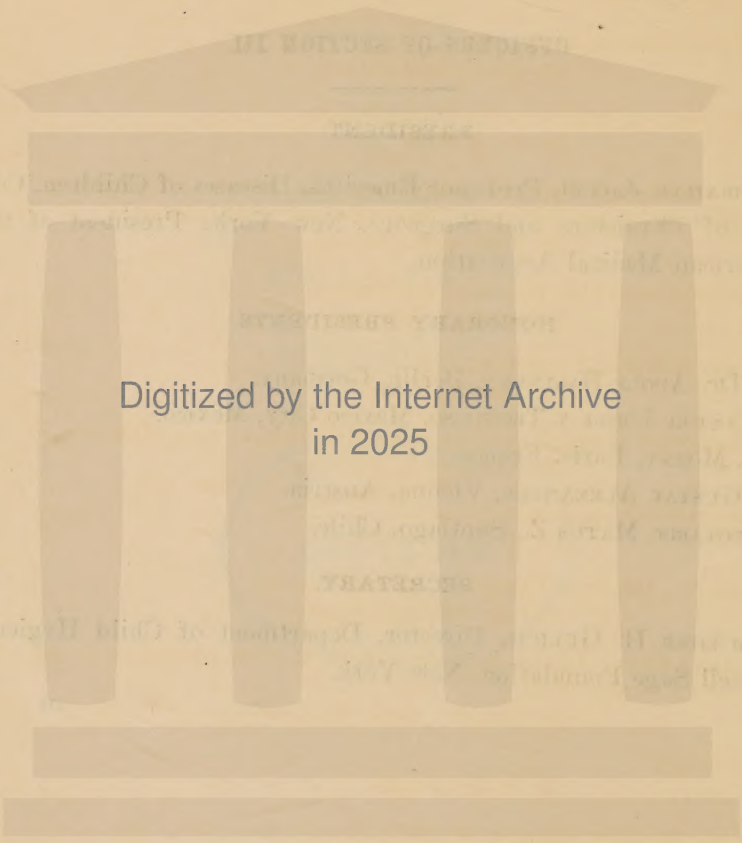
Dr. Abraham Jacobi, Professor Emeritus, Diseases of Children, College of Physicians and Surgeons, New York; President of the American Medical Association.

HONORARY PRESIDENTS.

Prof. Dr. Adolf Baginsky, Berlin, Germany.
Dr. Manuel Uribe y Troncoso, Mexico City, Mexico.
Dr. E. Mosny, Paris, France.
Prof. Gustav Alexander, Vienna, Austria.
Dr. Leotardo Matus Z., Santiago, Chile.

SECRETARY.

Dr. Luther H. Gulick, Director, Department of Child Hygiene, Russell Sage Foundation, New York.



Digitized by the Internet Archive
in 2025

https://archive.org/details/transactionsoffi0003unse

CONTENTS.

Page.

Address by the President 3

Report of the Secretary 3

Instruction in Child Hygiene 10
Dr. Mary Sutton Macy.

A Plan for Teaching Hygiene in the Public Schools 17
Dr. Ira S. Wile.

Open-Air Schools and Open-Air Instructions with Breathing Exercises in Schools and Colleges to Prevent Tuberculosis and other Diseases 22
Dr. S. Adolphus Knopf.

Some Fundamentals of the Hygiene of the Teacher 38
Dr. Grace N. Kimball.

Disinfection of Nose and Posterior Nares 45
Dr. John J. Cronin.

On the Occurrence of Syphilis and Gonorrhea in Children by Direct Infection .. 49
Dr. Abraham L. Wolbarst.

Sex Instruction and Hygiene of Boyhood 55
Dr. Elias G. Brown.

Hygiene of City Infants and Babies 69
Prof. Dr. Adolf Baginsky.

St. Margaret's House, Albany, an Institution for the Care of Babies and the Training of Nursery Maids 80
Dr. Henry Larned Keith Shaw.

The Foundling 86
Mr. Homer Folks.

Discussion of the Baby-Saving Show held in Philadelphia in May, 1912 90
Dr. Samuel McC. Hamill.

L'école de l'avenir 103
M. Augustin Rey.

The Effect of Humidity, Temperature, Air Movement, and Barometric Pressure on the Blood Pressure, Pulse, and Respiration of Children under the Influence of Various Forms of Ventilation 116
Dr. B. Raymond Hoobler.

The Routine Disinfection of Schools 131
Dr. J. T. Ainslie Walker.

Page.

The Reduction of Infant Mortality in New York City 139
Dr. S. Josephine Baker.

Die Bekämpfung der ansteckenden Kinderkrankheiten 152
Dr. Walther Ewald.

The School Children of the Stockyards District 170
Dr. Caroline Hedger.

The Management of Tuberculosis among School Children 189
Dr. Arthur Tracy Cabot.

Kinderkrankheiten während des Schullebens 195
Prof. Dr. Adolf Baginsky.

Mental Hygiene in the School 209
Dr. William H. Burnham.

Studies in the Relation of Physical Inability and Mental Deficiency to the Body Social 216
Dr. Isabelle Thompson Smart.

The Significance of Physiological Age in Education 224
Dr. C. Ward Crampton.

The Relation of Teacher and Pupil, with especial reference to the Education of Immigrants and of their Children in American Public Schools 237
Dr. William Estabrook Chancellor.

Results to individuals from medical inspection 245
Dr. Leo Burgerstein.

Some Important Aspects of Efficient Medical Inspection of Schools: A School Man's View 255
Dr. Willard S. Small.

What Medical Inspection of Schools Can Do for the Teacher 265
Dr. Helen MacMurchy.

A Follow-Up System in Medical Inspection 268
Dr. Thomas A. Storey.

Die Schulärztin an den höheren Mädchenschulen. Eine sozial-hygienische Forderung 273
Dr. Helenefriderike Stelzner.

The Public School as a Possible Factor in Preventing Infant and Child Mortality 286
Dr. Henry L. Coit.

The Need of Community Planning in Child-Welfare Work 290
Mr. Wilbur C. Phillips.

Parents' Cooperation in Promotion of Child Hygiene 294
Mrs. Frederic Schoff.

The Conservation of the Child 298
Dr. Charles Gilmore Kerley.

Prenatal Work in Certain American Cities 304
Miss Ellen C. Babbitt.

Page.

Infant Mortality and its Relation to the Employment of Mothers in Fall River, Mass. 318
Mr. Charles H. Verrill.

Field Work in Tuberculosis. 338
Dr. Mary E. Lapham.

The Preservation of the Teeth in Schools in Germany, and the Doings of the German Central Committee Intrusted with its Care. 343
Dr. Konrad Cohn.

Dental Hygiene for the Pupils of Public Schools. 350
Dr. S. Adolphus Knopf.

The Human Mouth in its Relation to Public Health. 359
Dr. W. G. Ebersole.

The Hygiene of Children's Teeth. 365
Dr. William H. Potter.

The Education of Partly Paralyzed Muscles. 378
Mr. Earl Barnes.

Training of Midwives in Relation to the Prevention of Infant Mortality. 382
Miss Clara D. Noyes.

Phases in the Development of the Infant Welfare Movement in England. 388
Dr. Janet Lane-Claypon.

Municipal Supervision of Maternity. 396
Dr. S. W. Newmayer.

The Prophylactic and Therapeutic Value of Fresh Air in Schools and Hospitals, including Heliotherapy. 406
Dr. John W. Brannan.

Remarks on the Anthropological Study of Children. 413
Prof. Franz Boas.

Physical Efficiency Tests during Adolescence. 420
Dr. J. H. McCurdy.

The Esthesiometric Method, Measuring Fatigue in the Light of the Logarithmic Method of Dr. Améline. 429
Dr. M. C. Schuyten.

Mortalidad Infantil en la Republica del Uruguay en el Decenio 1901–1910. 431
Dr. Julio A. Bauzá.

Account of the Proceedings of a Meeting of the Subsection on Mental Hygiene. 459

The Prevention of Feeble-Mindedness. 463
Dr. Henry H. Goddard.

The Scope of the Work of the National Committee for Mental Hygiene. 468
Dr. Lewellys F. Barker.

Notes on the Prevention of Epilepsy. 477
Dr. L. Pierce Clark.

Index (end of Volume III, Part II). 1039

BOSTON MEDICAL
APR 15 1914
LIBRARY

SECTION III.

HYGIENE OF INFANCY AND CHILDHOOD: SCHOOL HYGIENE.

REPORT OF THE SECRETARY.

Dr. Abraham Jacobi, *President Section III,*
Fifteenth International Congress on Hygiene and Demography.

Sir: In accordance with the provision of Article XII of the regulations of the congress, I herewith submit a report of the section proceedings of the meeting held at Washington, September 23 to 28, 1912, together with such manuscripts of the papers read as have been delivered into my hands.

Monday, September 23—1.30 p. m.

The first session was called to order by the president, Dr. Abraham Jacobi, who announced the following honorary presidents of Section III:

Prof. Dr. Adolf Baginsky, Berlin, Germany; Dr. Manuel Uribe y Troncoso, Mexico City, Mexico; Dr. Mosny, of the Academy of Medicine, Paris, France; Dr. Gustav Alexander, professor, Vienna, Austria; Dr. Leotardo Máttus Z, professor, Santiago, Chile.

After the announcement of the honorary presidents, the following remarks were made by the president of the section:

I prefer not to detain you with the discussion of any questions concerning babies or schooling. A baby is a small thing but has occupied many minds; yours in particular. The same I say about schools and schooling. I do not pretend to teach you anything new or old. On the contrary, you have come here to teach me and the rest of the people. So indeed I shall be glad to listen. I can not help considering this section of yours the most important of all. Saving children and instructing and educating them means the future of the republic and of mankind. It is on the foundation of pediatrics, as we understand it, that the gravest problems of sociology must be solved.

The president of this section begs to thank you for your presence in spite of some difficulties. When the program was completed and the Monday and Tuesday meetings were amply provided for, there came the invitation to the President's reception. It was meant as a kindness and as his appreciation of the aims and meaning of this great congress, but nevertheless it has interfered somewhat with the plans laid out for our meetings. Their results will in a great measure depend on your cooperation. The papers to be presented to you are many, and a great number of them valuable additions to your knowledge. I hope their authors will limit their public remarks to the presentation of what is novel or affords new viewpoints. It is understood that the reading of a paper should never occupy more than 20 minutes, not even so many as 20. The gist of a paper may usually be condensed so as to allow of time for dis-

cussion. You will share my opinion, fortified by much experience, that discussions furnish in many a case more results than a drawn-out lecture. But, as a rule, no individual discussion of a paper just read should occupy more than 5 minutes. The reading of a paper should generally be finished in 10 minutes. It will be printed in full, and no part of it will be lost to the student.

Now, there can be no doubt that it is the business of the presiding officer to be found fault with. While submitting to this law of congressional nature, he must and will keep order. Appeals to the meeting, however, he will obey. So let us go to work. Please remember that those in the audience have more rights than those on the platform; the latter have more duties.

Unless the speakers be heard they might rather not begin. Talking into one's own manuscript only is not complimentary to the listener. The reader's name will be announced from the chairman's place. Whoever applies for the floor to participate in a discussion will be good enough to pronounce his or her name loudly and proudly.

One more word. You may not approve of the place assigned to each paper on the program. Speaking for myself, or against myself, I admit that the program committee has not always succeeded in finding the proper position for every contribution. Mistakes must occur when the papers are coming in at irregular times and sometimes very late. But the chairman is now bound by the program. He will try to keep order, and asks for sympathy and patience when everything is not running smoothly. There is one point on which we shall have to insist—that is, the presence of a writer when his paper is called out. If he be absent, it will not always be possible, though both the chairman and the audience be willing, to accommodate him (though he be a she or addicted to any color, religion, sex, or other previous servitude). And now I am at your service; please deal gently with me.

Papers were presented in the symposium on the hygiene of infancy and childhood, as follows:

Instruction in Child Hygiene, by Dr. Mary Sutton Macy, School of Pedagogy, New York University, New York City.

A Plan for Teaching School Hygiene, by Dr. Ira S. Wile, New York City.

Open-air Schools and Open-air Instructions, with Breathing Exercises in Schools and Colleges to Prevent Tuberculosis and Other Diseases (with demonstration of exercises), by Dr. S. Adolphus Knopf, professor of medicine, department of phthisiotherapy at the New York Post-Graduate Medical School and Hospital, New York City.

Fundamentals of the Hygiene of the Teacher, by Dr. Grace N. Kimball, Poughkeepsie, N. Y.

Disinfection of the Posterior Nares, a Preventive against Infection, by Dr. John J. Cronin, department of health, New York City. (Read by title.)

The Occurrence of Syphilis and Gonorrhea in Children by Direct Infection, by Dr. Abraham L. Wolbarst, New York City.

Sex Instruction and Hygiene of Boyhood, by Dr. Elias G. Brown, director of the Mountain School, Allaben, N. Y.

The following members of the congress joined in the discussion: Dr. Frank Warner (Columbus, Ohio), Dr. Leo Burgerstein (Vienna, Austria), Dr. C. Ward Crampton (New York City), Dr. Maximillian P. E. Groszman (Plainfield, N. J.).

Tuesday, September 24—9.30 a. m.

The second session was called to order by the president, Dr. Abraham Jacobi, who presided throughout the morning.

Papers were presented on the subject of the hygiene of infancy and childhood, as follows:

Hygiene of City Babies, by Prof. Dr. Adolf Baginsky, Königl. Friedrich Wilhelms Universität, Berlin, Germany. (Abstract read by Dr. A. Jacobi.)

St. Margaret's House, Albany, an Institution for the Care of Babies and the Training of Nursery Maids, by Dr. Henry Larned Keith Shaw, Union University, Albany, N. Y.

The Foundling, by Mr. Homer Folks, New York City.

A Discussion of the Baby-Saving Show held in Philadelphia in 1912, by Dr. Samuel McC. Hamill, professor of pediatrics, Philadelphia Polyclinic, Philadelphia, Pa.

The Method of Construction Required at the Present Time by the Hygiene of the Modern Schools, and their Influence on the Health of Childhood, by M. Augustin Rey, architect, Paris, France. (Read by Mr. Adolphe Smith.)

The Effect of Humidity, Temperature, Air Movement, and Barometric Pressure on the Blood Pressure, Pulse, and Respiration of Children under the Influence of Various Forms of Ventilation, by B. Raymond Hoobler, A. M., M. D., New York City.

School Disinfection, by J. T. Ainslie Walker, F. R. S. M., F. C. S., New York City.

The following members of the congress joined in the discussion: Dr. Hastings H. Hart (New York City), Dr. Henry L. K. Shaw (Albany), Dr. L. T. Royster (Norfolk), Dr. P. M. Hall (Minneapolis), Dr. T. M. Koon (Grand Rapids), Dr. D. M. Totman (Syracuse), Dr. William Estabrook Chancellor (Norwalk), Dr. Thomas F. Harrington (Boston), Dr. J. N. Hurty (Indianapolis), Dr. Boyd W. Knight (New York City), Mr. H. O. Way (Cleveland), J. T. Ainslie Walker (New York City).

Tuesday, September 24—2 p. m.

The third session was called to order by the president, Dr. Abraham Jacobi, who presided throughout the afternoon.

The following papers were read:

The Reduction of Infant Mortality in New York City, by Dr. S. Josephine Baker, director bureau of child hygiene, department of health, New York City.

The Campaign against Infectious Diseases of Children, by Dr. Walther Ewald, Akademie für Sozial- und Handelswissenschaften, Frankfurt a M., Germany. (Read by title.)

The School Children of the Stockyards District, by Dr. Caroline Hedger, Chicago, Ill.

Management of Tuberculosis among School Children, by Dr. Arthur T. Cabot, Boston, Mass. (Read by title.)

Diseases Contracted during School Life, by Prof. Dr. Adolf Baginsky, Berlin, Germany. (Read by title.)

Mental Hygiene in the School, by Dr. William H. Burnham, professor of pedagogics, Clark University, Worcester, Mass.

Studies in the Relation of Physical Inability and Mental Deficiency to the Body Social, by Dr. Isabelle Thompson Smart, department of education, New York City.

The Significance of Physiological Age in Education, by Dr. C. Ward Crampton, director of physical training, department of education, New York City.

The following members of the congress joined in the discussion:

Miss Minnie H. Ahrens (Chicago), Dr. F. Duffield (Detroit), Dr. Thomas F. Harrington (Boston), G. J. Holmes (Newark), Dr. L. T. Royster (Norfolk), Dr. Ira S. Wile (New York City), Dr. Maximilian P. E. Groszmann (Plainfield).

Wednesday, September 25—9.15 a. m.

The fourth session was called to order by the president, Dr. Abraham Jacobi, who presided throughout the morning.

Papers were presented on the subject of school inspection, as follows:

The Relation of Teacher and Pupil, with Especial Reference to the Education of Immigrants in American Public Schools, by Dr. William E. Chancellor, superintendent of schools, Norwalk, Conn.

Results to the Individual from Medical Inspection, by Dr. Leo Burgerstein, K. K. Regierungsrat, Vienna, Austria.

Efficiency of Medical Inspection, by Dr. Willard S. Small, principal, Eastern High School, Washington, D. C.

What Medical Inspection of Schools Can Do for the Teacher, by Dr. Helen MacMurchy, Toronto, Canada.

A Follow-Up System in Medical Inspection, by Dr. Thomas A. Storey, College of the City of New York, New York City.

The following members of the congress joined in the discussion: Dr. Maximillian P. E. Groszmann (Plainfield), Dr. William Estabrook Chancellor (Norwalk), George J. Holmes (Newark).

Thursday, September 26—9.15 a. m.

The fifth session was called to order by the president, Dr. Abraham Jacobi, who presided throughout the morning.

The following papers were read:

The Activity of the Woman Physician in Women's Colleges, by Fräulein Dr. H. Stelzner, Charlottenburg, Germany. (Abstract read in English by Dr. Ethel Blume.)

The Public School as a Possible Factor in Preventing Infant and Child Mortality, by Dr. Henry L. Coit, Newark, N. J.

The Need of Community Planning in Child-Welfare Work, by Mr. Wilbur C. Phillips, Milwaukee, Wis.

Parents' Cooperation in Promotion of Child Hygiene, by Mrs. Frederic Schoff, president National Congress of Mothers, Philadelphia, Pa.

Conservation of Child Life, by Dr. Charles Gilmore Kerley, New York City.

The Conservation of Infant Life in Certain American Cities, by Miss Ellen C. Babbitt, Russell Sage Foundation, department of child helping, New York City.

A Study of the Infant Mortality in Fall River, Mass., and its Relation to the Employment of Mothers, by Mr. Charles H. Verrill, Bureau of Labor, Department of Commerce and Labor, Washington, D. C.

Thursday, September 26—2 p. m.

The sixth session was called to order by the president, Dr. Abraham Jacobi, who presided throughout the afternoon.

Papers were presented as follows:

Field Work in Tuberculosis by Dr. Mary E. Lapham, Highlands Camp Sanatorium, Highlands, N. C.

The motion duly made, seconded, and carried, it was

Resolved, That the resolutions introduced by Dr. Thomas F. Harrington be received and forwarded to the president of the Permanent

International Commission, Dr. Max Rubner, with an expression of our appreciation:

Whereas the keynote of the Fifteenth International Congress on Hygiene and Demography in promoting and in conserving health is education, cooperation, and organization; and

Whereas these means may be effectively fostered by a united intensive concentration upon a definite plan of action elastic enough to meet the needs of all: Therefore,

Be it resolved, That the Fifteenth International Congress on Hygiene and Demography designates the first Friday in October to be known as Health Day, to be observed annually by schools, municipalities, armies, and navies throughout the world as a means by which the prevention of preventable diseases and accidents may be learned and the cure of curable diseases intelligently appreciated, and further,

Be it resolved, That in the observance of Health Day all available resources of the home and of the school, of the teaching and of the medical and dental professions, of the municipalities, of the state, and of social organizations be fostered and utilized in each locality.

Resolved, That the permanent international commissioners of the Congresses of Hygiene and Demography be instructed to forward to national committees and to official delegates a copy of these resolutions as a part of the official report to governments, organizations, and institutions represented at the Fifteenth International Congress on Hygiene and Demography.

The Results of the German Central Committee in the Movement for Dental Work in the Schools of Germany, by Zahnarzt Dr. Konrad Cohn, Berlin, Germany. (Read in part by Dr. P. B. McCullough.)

Dental Hygiene for Pupils of Public Schools, by Dr. S. Adolphus Knopf, New York City.

The Human Mouth in its Relation to Public Health, by Dr. William G. Ebersole, chairman oral hygiene committee, National Dental Association, Cleveland, Ohio.

The Hygiene of Children's Teeth, by Dr. William H. Potter, professor of operative dentistry, Harvard University, Boston, Mass.

Friday, September 27—9.15 a. m.

The seventh session was called to order by the president, Dr. Abraham Jacobi, who presided throughout the morning.

Papers were presented as follows:

The Education of Muscles Suffering from Partial Paralysis, by Earl Barnes, Philadelphia, Pa.

Trained Midwives in their Relation to Infant Welfare, by Miss Clara D. Noyes, general superintendent, training schools, Bellevue and Allied Hospitals, New York City.

Organization of the Work of Infant Consultation and Health Visitors, by Dr. Janet Lane-Claypon, King's College for Women, University of London, England.

Municipal Supervision of Maternity, by Dr. S. W. Newmayer, in charge of division of child hygiene, bureau of health, Philadelphia, Pa.

Prophylactic and Therapeutic Value of Fresh Air in Schools and Hospitals, including Heliotherapy, by Dr. John W. Brannan, president, Bellevue and Allied Hospitals, New York City.

The Anthropological Study of Children, by Prof. Franz Boas, Columbia University, New York City. (Read by title.)

Physical Efficiency Tests, by Dr. James H. McCurdy, Young Men's Christian Association Training School, Springfield, Mass. (Read by title.)

The Esthesiometric Method, measuring Fatigue in the Light of the Logarithmic Method of Dr. Améline, by Dr. M. C. Schuyten, director of the Pedologic Laboratory, Antwerp, Belgium.

Mortalidad Infantil en la República del Uruguay en el Decenio 1901–1910, by Dr. Julio A. Bauzá, director del Consultorio Gota de Leche No. 1, Montevideo, Uruguay.

The following member of the congress joined in the discussion: Mrs. William Lowell Putnam (Boston).

I have the honor to report also the meeting, on Thursday afternoon, September 27, of the subsection on mental hygiene, Dr. L. F. Barker, chairman, Dr. G. L. Blumer, secretary.

The following papers were read:

The Prevention of Feeble-mindedness, by Dr. Henry H. Goddard.

The Scope of Work of the National Committee for Mental Hygiene, by Dr. L. F. Barker.

The Preventable Causes of Insanity, by Dr. Thos. W. Salmon.

Notes on the Prevention of Epilepsy, by Dr. L. Pierce Clark.

Limitations and Fallacies in the Education of the Feeble-minded, by Dr. Woods Hutchinson.

Respectfully submitted.

LUTHER H. GULICK, M. D.,
Secretary of Section III.

MONDAY AFTERNOON, SEPTEMBER 23, 1912.

INSTRUCTION IN CHILD HYGIENE.

MARY SUTTON MACY, M. D., Secretary of the Public Health Education Committee of the Medical Society of the County of New York.

Child hygiene is a comparatively recent development or specialization of interest in a broader field of practical care of the health of the individual and the community. Infant hygiene has had a longer period of careful attention, chiefly because the infant is more apt to be retained under the immediate care of the physician than is true of the older child. Municipal hygiene, industrial hygiene, school hygiene, and other subdivisions of the kind have received considerable, in fact extensive, attention because of their direct and vital bearing upon community efficiency, which is another way of saying, because they directly touch the public pocketbook and are to be reckoned in dollars and cents.

The larger number of children have the fortunate or unfortunate habit of being obstinately healthy, even in unhygienic and unsanitary surroundings, if we exclude the occasional infections to which all children are liable, though not necessarily subject, such as diphtheria, scarlet fever, measles, and the like. Therefore less attention was naturally attracted to the subject of child hygiene until the schools began to notice the laggards, the defectives, and the delinquent children. Subsequent investigations and study produced a growing sentiment in favor of helping these unfortunate and nonnormal children by paying attention to their personal hygiene at home and in school, and so child hygiene became an issue.

Even to-day, after several years of careful attention to the hygiene of childhood, the literature on the subject is meager, so far as I have been able to discover. By that I mean the literature which bears directly on the hygiene of the child—its physical hygiene, its mental hygiene, its moral hygiene, and its social hygiene—as influencing the individual at various periods of its growth.

We have a mass of undigested and more or less contradictory anthropometric data, very little of which is available to assist the parent and teacher in understanding the physiologic variations occasioned by growth, and most of which is therefore inadequate to serve them as a basis for practical hygiene.

We have libraries of so-called school hygiene, largely statistics and accounts of experimental investigations and mostly unapplied or

lacking in such elucidation as would make them readily applicable to masses of natural children by anyone but a trained statistical specialist in hygiene who possessed the power to expend unlimited money, unhampered by boards of education, boards of health, or other collections of individuals not in perfect sympathy with the particular "fads" of the specialist.

We possess a constantly growing ocean of literature on "child study," which concerns itself chiefly with the distinctly pedagogical and psychical interests of the child and gives but desultory and uninterested attention to the hygiene of physiological growth or, for that matter, to the real hygiene of mental growth.

We possess, even in medical literature, but scant information on the physiologic adjustments made by the complex human mechanism to the alterations in function, position, mechanism, and use of organs and systems incident upon alterations in growth. Here is a field for the statistician, for the experimenter, and for the digester and assimilator of literature to work together for the enriching of the literature of child hygiene.

Having thus briefly and sketchily reviewed the available means of instruction in child hygiene in the field of literature, let us consider what other sources of information are open to the parent, the teacher, and the general public.

(1) Let us consider the instruction of the parents.

(*a*) As individuals concerned with the individual care of their own children the parents can and naturally do turn to the medical profession for instruction in child hygiene. But few parents, even among the rich, feel that they can afford to go to the physician and pay the required fee in order to be told the details of simple cleanliness, fresh air, exercise, rest, work, and relaxation, which would best benefit their perfectly healthy child. Consult the physician if the child is sick? Yes. Get a prescription for medication as well as the advice in simple hygiene; and you have another proposition in the parent's mind. On the other hand, few doctors, be they general practitioners or specialists, would feel that they had time to give such hygienic advice for well children in the consultation hours which they are accustomed to devote to the cure of suffering humanity. And the poor can not afford such consultation at any time.

(*b*) As collections of individuals, in social groups, in mother's clubs, or in parents' meetings connected with the schools and settlements, parents can be instructed in the details of normal child hygiene by means of occasional talks or lectures, or of courses of teaching, which shall include not only the telling but also the showing how to do definite, necessary, and simple things to maintain the health of the normal child. These talks should be given by the school doctors, or the school nurses, or both; to the mother's clubs,

or parents' meetings of the school or settlement, and may well be supplemented, especially among the poor, by demonstrations in the selection and preparation of the child's food, exercise, and clothing, by the school-teachers of cooking, physical training, and domestic science; and they should also be supplemented by visits to the homes of the ignorant, to reenforce and reiterate necessary items of domestic hygiene. Among the better classes talks on child hygiene should form regular events of the meetings and lectures of the women's clubs, and might well form subjects for meetings at assemblies of men, such as lodge meetings and other gatherings, where fathers and prospective fathers may be instructed in that vital personal hygiene which concerns themselves as it pertains to their sons and to their daughters. All such talks or lectures should be given by physicians who are at once interesting speakers and authorities upon the subject they present, and should be supplemented by outlined reading.

(*c*) Colleges and universities which train the young men and young women of the country might well include the subject of child hygiene in the curriculum as a practical subdivision of domestic or even political economy, in such a form that it should serve to stimulate an appetite for more detailed knowledge by the individual before he or she assumes the rôle and duties of citizenship and parenthood.

(2) Let us consider the teacher's instruction in child hygiene. To be more accurate in the use of the present tense, I should have said let us consider the teacher's lack of instruction therein. In no other profession with which I am in the least familiar does the practitioner know theoretically so much about the tools for the work and so little about the material upon which the work is to be performed. Our normal colleges and training schools for teachers ground their students most carefully in method and in matter to be taught, including much theory in psychology, in didactics or induction, in *school* hygiene—note the emphasis on the qualifying adjective, please—in grammar and rhetoric, in discipline, in domestic science, and other sciences which the future teachers may or may not be able to put into practice, depending upon the character and amount of supervision they are subjected to, and the whims of the school boards which may govern their individuality, but, alas! it must be confessed the physiology taught to the teachers is a farce, the hygiene is theoretically good for the school and practically impossible with the child. It is strange how insistently perverse is the human nature of the normal healthy child, which refuses to conform, in any safe number of particulars, to the data offered as characteristic of the average child in the carefully taught rules of "child-study classes." Fortunately for the future of our country, the children do persist in refusing to be average. Why lay so much emphasis upon the biology

of invertebrates and lower vertebrates, details of which the high-school teacher must give to her classes, and absolutely refuse to teach the teacher any practical biology of man? The child is the material upon which the teacher's work must be done. It is only fair and just to child and to teacher that the child's nature should be known to and understood by the person who is expected to develop and train it. The mistake pedagogy has made, and continues to make, is to emphasize the psychic nature of the child, and ignore the physical—the fundamental—nature, which must be normal before the psychic can mature.

The courses in physiology and hygiene of childhood in the normal schools and training schools for teachers should be practical; not only didatic or inductive, but laboratory, methods being employed. They should be wide in scope and inclusive in range of years covered, and they should be compulsory on all teachers.

The physiology course should be practical, not only in the instruction of details of mature function in the digestive, the respiratory, the circulatory, the excretory, the muscular, the nervous, and the reproductive systems, but also in the variations of balance incident to and consequent upon variations in maturity. The differences observable at stated periods of growth, and the effects thereof upon the physical efficiency of the child, should all be made definite and repeatedly emphasized to the pedagogical student. This should be a major course in the curriculum and should be taught by a specialist, preferably a physician or an expert from a physiological laboratory, and not by a teacher from the ranks.

The course in hygiene of childhood should be parallel with the physiological course, and should aim to apply to the uses of the teachers, the physiologic truths, and data furnished by the major course. Practical opportunity to apply the knowledge gained should be liberally supplied. The student-teacher should be called upon to give evidence of efficiency, by suggestions in actual cases, for (1) the improvement of home hygiene in specific cases, (2) for the adaptation of the ordinary schoolroom facilities to the greatest good of the greatest number of individual children in a given class, and (3) by being required to make practical suggestions for the improvement of the existing school conditions, with a view to minimizing the non-hygienic obstacles in the paths of the children of the given class. This course also should be conducted by an expert.

(3) Let us consider the instruction of the general public in the hygiene of childhood.

It is to be accomplished in a variety of ways. First, by occasional free public lectures by well-known and competent authorities; second, by newspaper and magazine propaganda; third, by lecture

courses, under the auspices of boards of education, boards of health, university extension, or local medical societies; and, fourth, by societies for the study of child hygiene, which give lecture courses, publish authoritative data in inexpensive and easily comprehensible form, and which in other ways attempt to mold public opinion.

The scope of public instruction should include such general topics as (1) the character, preparation, variety, and amount of foods for children of varying ages; (2) the ventilation of the home, the nursery, the sleeping room, and the school and playroom; (3) the value of exercise, its kind, amount, environment, restriction, and scope, according to the age periods of the child; (4) outdoor life, its educational as well as its hygienic value and significance; (5) sleep, and its amount, environment, bedding, clothing, and hours, according to varying age periods; (6) clothing, its nature, texture, character, variety, amount, and the dangers of inadequate, superabundant, and improper clothing; (7) work, character and amount of mental, manual, and physical work which is legitimate for various stages of physiological maturity, dangers to the child and the community from child labor; purposes of the varied curriculum and its so-called fads and frills; (8) sex hygiene, its relation to social morals, physical health, and community efficiency; its methods of instruction, time, place, and specific information to be given at differing ages; (9) play, its meaning, supervision, time, and character; and (10) personal hygiene and the prevention of contagious diseases.

Time forbids a more lengthy statement of the means, but we must glance for a few moments at the needs for instruction in child hygiene, and I would ask you to consider these under the following heads: (*a*) Individual needs of children, parents, and teachers, (*b*) school needs, (*c*) social needs.

A. The individual needs of such instruction for the children are that they may have (1) " fair play " and (2) an opportunity to react in a normal fashion to environments adjusted to develop the maximum of efficiency with a minimum of wear and tear on health and of waste of energy.

The individual needs of instruction in child hygiene for the parents are to enable them to fulfill their duty to their child by providing, in so far as is physically possible, an environment which will promote the development in their offspring of the desirable traits of biologic heredity, and afford opportunity for the healthy maturing of all physical and psychical functions in due order and due time.

The individual needs of instruction for the teachers are that they may be enabled to make use of their knowledge, not only to prevent wear and tear for themselves and their pupils, but also, by removing

preventable obstacles, and promoting normal conditions, facilitate the development and growth which they desire, and direct its course along natural lines at normal times.

B. The school needs which call for instruction in child hygiene are manifold, and I shall suggest but a few of them: (1) The maintenance of a normal standard of efficiency in the physique, and therefore in the minds of the children; (2) the regulation of the curriculum to the capacities of the child, by avoiding overstimulation and consequent exhaustion through a crowded curriculum, and by avoiding understimulation and consequent inertia among the supernormal or highly gifted children, to whom the present curriculum might readily be adapted without being overcrowded, and by avoiding misdirected stimulation, prevent much truancy, delinquency, backwardness, and inefficiency; and (3) the institution and development of a practical eugenics, which shall assist in the elimination of mental deficiency and preventable physical deficiency, by a broad education in the value of physical and mental efficiency in community life.

C. The social needs, like the school needs for instruction in child hygiene, are legion, and we have time to name but a suggestive few; (1) the prevention of child labor; (2) the dangers to child life of congestion of population and therefore its relation to community welfare; (3) the value of the healthy child as a community asset, and its place in the social system; (4) the dangers to social efficiency in childhood as well as adult life, from debauchery, prostitution, and all forms of vice; and (5) the rights of the child—who has not asked to be born—and the social, moral, and physical obligations of its parents and the community in which it lives.

In closing, let me give a few items of interest which I have obtained as the result of a questionnaire sent out this last April concerning what has been done along the lines suggested in this paper in the city of New York within the last few years.

Inquiry brought out the facts that the following opportunities were freely used for the instruction of parents in child hygiene:

(1) In schools, vacation playgrounds, offices of philanthropic organizations, and in milk stations, lectures on the care of infants and on child hygiene are given by doctors and nurses regularly appointed in the Department of Health, under the Division of Child Hygiene organized in 1908. This division also provides literature in the form of pamphlets for free distribution.

(2) The Association for Improving the Condition of the Poor, under its committee on physical welfare of school children, gives lectures in public schools, though it is not specified if these are pertinent to child hygiene per se. In 1910 this committee also employed

dieticians to instruct mothers on the recreation piers in the cooking and serving of proper food.

(3) The Public Education Association, through its parents' meeting committee and in cooperation with the Society of Sanitary and Moral Prophylaxis, devotes its time to teaching of sex hygiene to the mothers' clubs of the public schools.

(4) The Public Health Education Committee of the American Medical Association, through women's clubs, parents' association, church organizations, settlements, and other groups, reaches large numbers of mothers and fathers. Its lectures are given by physicians, and in cooperation with the medical societies of New York and Kings Counties, courses of lectures have been given every year since 1909, and are very popular. Many of these lectures are on child hygiene.

(5) The People's University Extension Society also provides lecturers to settlements, institutions, schools, clubs, churches, libraries, etc.

These last two organizations provide lectures in other than the English language, if necessary. Both have child hygiene as one of many topics in their list.

Many of the organizations mentioned provide lectures for teachers' clubs and organizations as well as for parents, but, so far as I have been able to learn, no provision is made for the adequate training of teachers by either the Board of Education or any of the other organizations or schools for the training of teachers in the city of New York. Teachers' College, of Columbia University, offers a course in child study under a psychologist and in school hygiene, including a course on hygiene of childhood, under a physician and a nurse, but I can not discover that this latter course is comprehensive or practical, and the child study is primarily psychological, all hygiene being incidental. The School of Pedagogy of New York University is even less active, the courses offered there being on the "Physical nature of the child" and "Anthropological study of school children," but child hygiene is merely incidental. The training schools of the Board of Education offer nothing practical, and the physiology and hygiene they pretend to give are not so presented as to appeal to the teacher or student as important subjects.

The Board of Education, in its public-lecture courses, occasionally includes some topic of child hygiene. The Board of Health conducts a more or less vigorous campaign in health education—child hygiene included—and many of the settlements in cooperation with such organizations as the Public Health Education Committee of the American Medical Association, the Public Education Association, and others in the first list given are all actively engaged in teaching the public the importance of child hygiene.

A PLAN FOR TEACHING HYGIENE IN THE PUBLIC SCHOOLS.

Ira S. Wile, M. S., M. D., New York City.

The purpose of education is to protect the State from all dangers arising from ignorance, disease, moral degeneracy, industrial retrogression, criminality, and civic unrighteousness.

The state, as a form of social organization, is but a single type of social unit. The relation of the state to the city, on the one hand, and to the nation, on the other, has varied responsibilities. The family may be regarded as a social unit, but its status depends upon the development of the individuals comprising the various families. In the last analysis the strength of the nation is limited by the strength of the weakest individuals of which it is composed.

The basis of social education lies essentially in the socializing of individuals by the development of the latent social instincts into a definite, purposeful social consciousness.

Hygiene is the science that treats of the laws of health. Social hygiene is the science that treats of the laws of health in the broadest sense as related to the welfare of society as a whole. Social hygiene includes personal hygiene, family, municipal, state, and industrial hygiene.

The proper place at which to teach the basis of social hygiene is the elementary school. Ninety-four and one-half per cent of the school children fail to get above the elementary schools. The period of education in social hygiene should be within the period of compulsory education.

With a view to developing a logical course of instruction in social hygiene that may be useful to teachers, I have prepared the following suggestions for graded syllabic lessons, which are submitted with a realization of their imperfections. For some schools the plan may be regarded as too inclusive, while other schools may deem it lacking in some essentials. The plan is based upon a correlation of existent courses in nature study, physiology, hygiene, domestic science, civics, etc., without the introduction of new studies and without any additional cost to the educational authorities.

The success of this plan for teaching social hygiene must depend, as does every part of the school curriculum, upon the interest, spirit, and conscientiousness of the teacher.

The expression "dry as bones" aptly describes much of the present teaching of physiology and hygiene. In the mode of teaching the cart is placed before the horse. The average child will readily grasp and appreciate the facts that are essential to the correct mode of living, while it lacks the interest so necessary to stimulate attention to the weird assortment of anatomical and physiological statements that are supposed to form an essential part of the school curriculum.

Considerable knowledge of the close harmony of the various parts of the body may be acquired in a normal manner through the study of hygiene. The appreciation of the reasons for the hygienic principles that tend to prolong life and to promote bodily health necessitates an understanding of the most practical facts in anatomy and physiology.

Much stress has been placed upon the methods best adapted to the instruction of children in physiology, but only during the past few years has thought been given to the value of the information that is obtained by the present system of teaching the subject.

A careful analysis of the general subject of hygiene discloses the fact that it is based upon the consideration of a few fundamental topics that appear to be closely interrelated and that are the main factors in determining the physical and mental status of an individual or a community. Air, sunlight, clothing, exercise, rest, food, cleanliness, and order form the basic subjects that, in the aggregate with adequate discussion, constitute hygiene.

Society as a whole is built up of various units, all of which may be resolved into individuals. In the consideration of a method of approaching the subject so as to secure the greatest effectiveness for the teacher or the scholar, a synthetic method is far more valuable than an analytic method. To contemplate the universe and recognize the guiding principles that govern the planets and the nations as well might be an ideal exercise for a trained philosophic student. To understand the dominating rules of life as they apply to the individual and then to perceive the relation of these individual rules to the life of a family is far more reasonable for the child mind. To grasp the relation of personal hygiene to the health of the family is a stepping-stone to an intelligent conception of the relation of individual hygiene to the health of a group of families such as would constitute a neighborhood.

Further extension of the same principles of personal hygiene is involved in the understanding of the particular problems that are indissolubly connected with the city. The state, the nation, the world are three greater syntheses of a small social unit, the individual. Thus society may be regarded as a series of concentric circles, possessing the individual as a common center. The outermost circumference embraces all the other circles, though the area involved consists of an aggregate of individuals whose various combinations are delimited by the several lesser circumferences.

If one regards the few basic hygienic factors as centering in the individual, and going therefrom in direct lines that may be regarded as ever-lengthening radii of the concentric circles, there appears at once a simple system for the instruction of the young or the old in the general scheme of social hygiene. A careful and intelligent study

of the laws of hygiene as they affect the individual leads to an intelligent appreciation of the relation of hygiene to civilization and organized society.

In an outline to cover various grades of the public school it is essential to get the bulk of the hygienic material into the curriculum during the period of time for which the maximum number of children are at school. This makes it necessary to grade a course in hygiene so that the main elements are disposed of before the sixth grade. The continuation of the development of hygienic themes is to be found in the upper grades of the elementary school and might well be carried throughout the secondary schools.

In arranging a syllabus of hygiene upon a social basis the units of social development must be considered. First comes the element of self or personal hygiene. During this period it is important to take up such fundamentals as position, breathing, cleanliness, the value of fresh air, sunlight, exercise, with some comment upon clothes, especially as related to the baby, the necessity for keeping them clean, etc. Foods must be treated in a most elementary way, but stress can be placed upon the use of coffee and tea, the eating of candy between meals, the ill effects of too much ice water. Stress may be placed upon the necessity of mastication. Rest plays a part in hygiene that might well receive attention in the very early grades. A sense of order needs development, as it is a fundamental of personal hygiene whose greatest value may be seen in the development of the hygiene in later years. Such a series of talks might well be correlated with simple experiments with animals and plants or instruction suggestive of how plant and animal creation keeps itself clean. Demonstration of the effect of sunlight on plants and animals will help to emphasize the advice given on these subjects.

The next form of hygiene to be evolved is that which contemplates the idea of another self. It is elementary altruism, the essential importance of protection of some one else. Under this head, naturally, would come such hygienic themes as the use of individual cups, toothbrushes, wash cloths, towels, drinking glasses, the dangers of contagious diseases, regard and respect for the health of others. At the same time there may be indicated the important idea that what is good for one is not good for another; the care of the bedroom, the necessity of open windows, undressing before retiring, the unhygienic use of feather beds, and similar other themes naturally suggest themselves. The subject of family pets, as cats and dogs, carries with it in content not alone the ordinary care of bathing and feeding, but is designed to introduce the love of animals and an understanding of what constitutes cruelty to animals. It includes the dangers that may arise from too close contact with animals more or less diseased. Fresh air carries with it suggestions relating to smoke and smoking

and the importance of fresh air in rooms at all times. Dancing and its hygiene will bear many comments at this time. Again, such themes should be correlated with talks upon the familiar animals, as cats and dogs, and insects, and such plants as the common fruits, vegetables, and trees; while the effect of natural phenomena, of water, air, and sun, will help to make clear the hygienic applications.

The real essential unit which would be reached about the age of 9 years would be a discussion of the hygiene as related to the family. The interrelation of members of the household and the hygienic import of division of labor forms a basis for initiating the program. Home cleanliness, moderate temperature of rooms, proper airing and lighting, form valuable phases of family hygiene. The relation of dust to exposed foods, the dangers from flies and insect pests, all relate directly to this phase of family sanitation and hygiene. Isolation of the sick in the home, the importance of quarantine and disinfection give excellent opportunity for making the child understand the value of such health procedures.

The hygiene of study, as related to position, light, print, and intensity, will serve the school as well as the home if dwelt upon at this particular age. This bare suggestion of themes may well be correlated with the life history of the bees and the ants, bird life, and the schools of fish; forestry and sown fields. The effect of the sun and the development of warmth, the seasons, all serve further to explain this phase of social hygiene.

With the grouping of families, neighborhoods are constituted. There is immediately a recognition of the interdependence of families for food, clothes, and similar other necessary commodities. The hygienic value of the golden rule may be pointed out without dwelling upon its religious aspects. The nature of disease, its spread by microbes, the relation of the individual to an epidemic, represent some of the hygiene of this period. Removal of garbage, the importance of clean back yards, the unfairness of careless sweeping, shaking dusty rugs or garments out of the windows, are all part of neighborhood hygiene. The relation of the school medical inspectors and nurses indicate the relation of the neighborhood and the school in the protection of individual homes. The school and its hygiene, as it relates to lighting, ventilation, open-air schools, toilet facilities, crowding, may be carefully developed by the thoughtful teacher. Naturally, there grows from this all that relates to the prevention of disease in school, the individual pencils, vaccination, exclusions for contagious disease, the importance of lessening physical defects. There may be correlated, in explanation of such topics, a study of the zoo, of the jungle, or the aquarium, the forests, the fields in the form of gardens, while mountains and rivers and islands and continents present natural phenomena in geography that are also instructive.

The interrelation of neighborhoods results in the formation of a city whose hygiene is again a development of the original lines of thought. Again, the problem of removal of garbage and ashes, the questions of street cleaning and proper sidewalks require discussion. The freshness of the air involves soft-coal nuisances and smoking lamps, and the growth of the subject to a consideration of indoor work and dusty trades is but a natural expansion of the original theme. The importance of congestion, tuberculosis, the value of food ordinances, the dangers from an impure water supply, the tremendous gain through isolation and segregation in contagious diseases, represent useful topics in municipal hygiene that might well be taught to the children in the prepubertal period. The value of trees, the relation of city lighting, the connection between the city beautiful and health, even, indeed, the necessity of city planning, would be embraced in a plan of social hygiene as related to city problems.

It is unnecessary to go further in the development of our program. I believe the suggestion is clear without further elaboration. The plan, in brief, is to consider the evolution of hygiene in an elementary school upon the basis of the evolution of society, and to so arrange the information to be given to the children that it will be adapted to their age, grade, and experience; while, at the same time, the course is naturally developed from a single point of view instead of being thrown into a curriculum without plan or thought and too frequently left to the discretion of the teacher.

The importance of correlating all the topics in hygiene to natural history, geography, civics, and economics is not to be overestimated. If public schools are to prepare for citizenship, it may be recognized that a citizen who is conscious of his hygienic duties and sanitary responsibilities is of far greater value to a community than one who is brought up in ignorance of these important topics. The main feature that I would call attention to is that hygiene is taught as a subject by itself, and the physiology is drawn in, as it were, through a discussion of the hygienic problems, instead of appearing as a formal subject on the program. Anatomical details are entirely omitted, inasmuch as, to the child in the elementary school, they are of no value theoretically or practically, save in so far as they have some relation to his every-day life. In the higher grades, it might be desirable to take up the subjects of anatomy and physiology, as formal studies, but, in that case, the perspective will be, practically, hygiene, and the interest of the children in the subject will be enhanced, whereas, under the present system, it is merely a test of memory.

The social hygiene instruction is constituted practically from the educational content of the various subjects already on the curriculum. It is necessary to so correlate history, civics, domestic science, physical

education, geography and similar subjects, that they will all bring to social hygiene their proper latent forces. The general result will be an improvement in the standard of health of the individual children, and a marked betterment of the hygienic conditions of the community in which such children grow to become citizens.

DISCUSSION.

Dr. Frank Warner, Columbus, Ohio: In many of the smaller communities it is not often possible to follow the plans of teaching hygiene that may be applicable to New York, Berlin, or any of the great medical centers where skill, training, and money are all available in an unlimited way. In the smaller communities, the teaching of hygiene should be combined with the duties of the medical inspection of schools. And even then many of the inspectors will need to be taught that there are broader duties devolving upon the position than looking for adenoids, enlarged tonsils, defective vision, and contagious diseases, as valuable even as this work is. These matters should be taken up through the various medical societies through the various countries here represented, to the end that more uniform and better work be accomplished; remembering all the time, however, that the work of teaching hygiene in the schools ought to be adapted as far as possible to the community in which the work is to be done.

OPEN-AIR SCHOOLS AND OPEN-AIR INSTRUCTIONS WITH BREATHING EXERCISES IN SCHOOLS AND COLLEGES TO PREVENT TUBERCULOSIS AND OTHER DISEASES.

S. Adolphus Knopf, M. D., Professor of Medicine, Department of Phthisiotherapy at the Postgraduate Medical School and Hospital, New York.

Among the many telling sentences in that brilliant presidential address of Prof. Wm. H. Welch, of Baltimore, delivered at last year's meeting of the National Tuberculosis Association in Denver, there is one that reads as follows:

> In the light of our newer knowledge, there is abundant reason for the ever-increasing emphasis placed upon the importance of attacking the problem of tuberculosis in the early years of life.

There is no question in the mind of any worker in the tuberculosis field that this portion of our tuberculosis crusade is, indeed, not only the most important, but also the most difficult one to deal with. The 5 to 10 per cent of tuberculosis in childhood, which can be traced to the bovine type of the bacillus, would seem almost the easiest part to prevent. This could be done by the wise enactment and judicious enforcement of bovine laws, but, in order to be effective, these laws, as well as their enforcement, must emanate from the force of our

central Government. Individual State laws are of little use as long as they differ from each other, are reasonably severe in one community, and ridiculously slack in the next. Bovine laws must be enacted and enforced uniformly, and this is only possible with the aid of a Federal department of health. With such laws, enforced by the supreme power of the United States Government, it is my firm conviction that the bovine type of tuberculosis can be annihilated within a decade. I believe that the 10 per cent of deaths we now have from this form of tuberculosis in childhood can be prevented; that the economic loss accruing to a community because it has educated 5 per cent of its children at the age from 8 to 14, and then had them die from a preventable disease, can be saved; and, last but not least, that the vain sacrifices made by parents, the sorrow and agony they had to experience through the untimely loss of beloved children, may be spared to them. Let those who still oppose the creation of a Federal department of health take this to heart, and remember that by their opposition they must be held responsible for the untimely deaths of thousands of American children.

Although but a small percentage of tuberculosis due to the human type of the bacillus can be traced to direct bacillary transmission via placenta, we all know that postnatal infection from either parent, but particularly from the mother, when tuberculous, is one of the most frequent causes of the disease in childhood.

It is not within the province of this paper to speak of the prophylactic measures and regulations which should prevent tuberculous procreation. I have very strongly expressed my views on this subject in other publications, to which I must refer my readers.[1] I am here to-day to tell you what I believe might be done for the child who is tuberculous or is likely to become so by reason of a predisposition inherited or acquired.

It is very easy to say "take away the tuberculous child from its tuberculous parents, raise it in the best of hygienic environments, give it good food and plenty of air, and you will overcome the tuberculous predisposition or cure the infected child."

That such a procedure can be inaugurated only in the smallest number of cases must be evident to all who have studied tuberculosis, not only from its medical but also from its social aspect. In the majority of cases the separation of the child from the mother is out of the question. A beloved teacher of mine, the late Prof. Grancher, of Paris, thought to solve the problem by placing the children of tuberculous parents residing in the city of Paris in country homes as early as possible, having them there supervised by the local physician and returned to the parents when, in his opinion, children had grown to be vigorous and strong enough to resist invasion of the

bacilli. He called his work "Œuvre de preservation de l'enfance contre la tuberculose." The work is still carried on by the widow of that great master and lover of children. That this work accomplishes a great deal of good there can be no doubt. The only question which there can be is whether it is not possible to accomplish a good deal more by removing mother and child or the entire family into the more sanitary quarters of the city and teaching them all hygiene and outdoor life and sending the children in time to open-air kindergartens, open-air schools, and open-air colleges.

To place not only the child but the mother as well—in fact, the entire family—in hygienic environments, where they may breathe good air, have clean, well-lighted rooms, perhaps so arranged that outdoor sleeping is feasible, and where there is medical supervision, would seem far superior to the separation of child from mother. By this method the whole family would receive the benefit of preventive and curative care.

While the out-of-town districts would be ideal for such homes of tuberculous families, it seems that even a great city, when it has citizens public spirited enough to devote their fortunes to so laudable a purpose, may have such a home hospital. A beautiful example of a sanitary home for tuberculous or predisposed families exists now in the city of New York, at Seventy-eighth Street and John Jay Park. It is known as the East River Homes and was built by the generosity of Mrs. William K. Vanderbilt, sr. Here a number of families with members who are strongly predisposed to tuberculosis or have recovered from the disease receive the advantage of almost ideal homes, with every room lighted and ventilated and with all modern sanitary improvements, for a most moderate sum. To give also to such families where the breadwinner is yet an invalid or not strong enough to support a family the advantage of such a home, the New York Association for Improving the Condition of the Poor has leased for three years an entire section of the East River Homes. This section consists of 24 apartments with a southeastern exposure. The trustees of the East River Homes have given the association entire control of the open stairway leading to these apartments and free access to and partial control of the ideal roof garden. These families will be carefully supervised by physicians and nurses.

On top of the Vanderbilt houses are beautiful roof gardens which, I understand, will, as soon as possible, be utilized as open-air schools. However, open-air schools, open-air kindergartens, and outdoor play facilities should not only be provided for the tuberculous and the tuberculously predisposed, but for all children, if we wish to combat tuberculosis as a disease of the masses. In the city of New York, for example, where, owing to the density of population and the topography of the island, playgrounds and small parks are neces-

sarily limited, we have nevertheless thousands of acres of unoccupied, unutilized roofs which could easily be transformed into open-air schools and playgrounds. Of course, we have made a beginning in New York, but our efforts have thus far been limited to the care of a very small number of tuberculous and anemic children.

We have at this time in New York City 12 open-air classes connected with the public-school system. According to the statistics kindly furnished me by Dr. Thomas S. Carrington, assistant secretary of our National Tuberculosis Association, the number of pupils attending these 12 public schools is 526. The 12 open-air schools in New York City are as follows: Seven fresh-air classes, located at Mott and Spring Streets, 57 West Forty-fourth Street, 272 East Tenth Street, Eldredge and Hester Streets (for boys), Eldredge and Hester Streets (for girls), West Twenty-eighth Street (for boys), West Twenty-eighth Street (for girls); four open-air classes, located at Bellevue ferryboat, No. 2 Bellevue ferryboat, Vanderbilt Clinic, ferryboat *Middletown*; one open-air school on ferryboat *Susquehanna*, Brooklyn. Besides these classes of the public schools, the Horace Mann School established last year an open-air class with 40 pupils taken from the primary grades, and the Society for Ethical Culture announces that it will establish an open-air school, for 60 pupils of the fourth, fifth, and sixth grades, on September 25, 1912. This would give to New York City 14 open-air schools, with a capacity for 626 children coming from all classes of society.

For the rest of the United States there are, according to the following statistics, also kindly furnished by Dr. Carrington, at this time in operation 41 schools, accommodating 1,229 pupils. To this must be added 4 summer schools, and for the coming year there are projected 8 open-air classes in the cities mentioned:

List of open-air schools in the United States.

City.	Number of schools and classes.	Number of pupils.	City.	Number of schools and classes.	Number of pupils.
Monrovia, Cal.	1	.....	Albany, N. Y.	1	25
Oakland, Cal.	1	25	Buffalo, N. Y.	1	20
Colorado Springs, Colo.	(1)	.....	Schenectady, N. Y.	(1)	.....
Denver, Colo.	(1)	.....	New York City	12	526
Hartford, Conn.	1	25	Rochester, N. Y.	1	30
South Manchester, Conn.	1	20	Syracuse, N. Y.	(1)	.....
Washington, D. C.	1	35	Cincinnati, Ohio	2	40
Chicago, Ill.	(2)	.....	Do	[5] 1	35
Do	6	[3] 250	Columbus, Ohio	[6] 2	.....
New Orleans, La.	2	160	Hazelton, Pa.	1	40
Boston, Mass.	[4] 5	100	Mount Airy, Pa.	1	30
Cambridge, Mass.	1	30	Philadelphia, Pa.	3	[3] 75
Grand Rapids, Mich.	2	[3] 40	Pittsburgh, Pa.	2	75
St. Paul, Minn.	(1)	.....	Williamsport, Pa.	(1)	.....
Montclair, N. J.	1	21	Pawtucket, R. I.	1	25
Newark, N. J.	1	30	Providence, R. I.	1	25
Orange, N. J.	2	43	Kenosha, Wis.	1	30

[1] Not yet in operation. [3] Approximately. [4] Classroom. [5] Open-air room. [6] Schools projected.
[2] Tuberculosis Institute School (three or four extra schools during summer months).

The results obtained in open-air schools is well known to all who have been privileged to examine and watch the children. I could fill these pages with testimonials calculated to make of any and every body an enthusiast, but I shall only quote a few authoritative statements and not omit the more conservative ones. The latter are, to my mind, as significant as the former. Thus, in the medical report on "Outdoor classes for anemic children" for the year 1911–12, kindly furnished me by the courtesy of Mr. Mann, the secretary of the tuberculosis committee of the C. O. S., and Dr. Woodruff, the physician in attendance, the conclusions are as follows:

First. That in the special outdoor classes for anemic children as at present conducted subnormal children improve in mental and physical tone, in the iron content of their blood, and, to a certain extent, in nutrition.

Second. That the improvement in nutrition and gain in weight may possibly be dependent to some extent on the food received in the school.

Third. That the gain in hæmoglobin bears no relation to the amount or character of the food given in the school, but is due, in all likelihood, to the effect of continuous life in the fresh air day after day.

Fourth. That the effect of the outdoor class is not or may not be transitory.

Fifth. That from the study of the "control classes" and the children discharged from the anemic class at Public School No. 21 it is likely that the environment of the ordinary classroom has some deleterious effect during the winter, at least, which tends to produce an anemia.

An interesting statement concerning results for the first outdoor school in the United States, and more optimistic, was published in the Journal of the Outdoor Life for March, 1909, by Mr. Walter H. Small, at that time superintendent of the Providence schools. After describing the interest the general public had taken in this first open-air school, he said:

The school enrollment is varying, and the work is necessarily individual. Each does what he can; he is not urged, but he sits in the sun, keeps healthfully busy, drinks in fresh air, and grows stronger physically and more alert mentally. To see the color come into the cheeks and the sparkle into the eyes, and to see the emaciated form fill out, convinces those close to the work that it pays abundantly.

The result of the first outdoor school in Chicago is indeed surprising. It was kept open only one month. There was a gain of from 1 to 7 pounds, and, considering the general condition, Principal William E. Watt, of the Graham School, expressed himself as follows:

The children are delighted to breathe pure air all day in school and out. They are not compelled to stay in the room, but there are many more clamoring to get in. It has been a most successful experiment. Pupils have been cured of catarrh, swollen glands have been reduced to normal size, and tuberculous symptoms have disappeared. Their resistance to disease has been raised, and they are much more healthy.[3]

Because in New York City the open-air schools connected with the public-school system have been primarily intended for tuberculous or predisposed children, the following report of Prof. Maxwell, superintendent of the city public schools, for the year 1911, is highly instructive:

The city of New York has incorporated in its school system outdoor classes in the regular school buildings during the school year for anemic children, children predisposed to lung tuberculosis, and children with other organic troubles, such as heart disease. Secondly, tuberculous classes for children who are excluded from the regular schools because they are afflicted with open tuberculosis. The board of health excludes from the public schools all children afflicted with this type of tuberculosis.

In order to try the effect of the open-air treatment on these children, the authorities of Bellevue Hospital assembled a number of them on a ferryboat. Here they were kept in the open air during the day, were fed and were under medical supervision. They slept at home. Not having anything to do all day, the children tired and asked that a teacher be allowed them. Thus, began the relation of the school system with classes of children excluded from it. There are now classes for tuberculous children on four ferryboats, moored to docks on the East River front, and two classes on the roof of the Vanderbilt clinic. These classes are annexes to the following schools: Public School 12, Manhattan; Public School 14, Manhattan; Public School 37, Brooklyn; Public School 141, Manhattan; and Public School 151, Manhattan. Pupils to the number of 474 attended these annexes last year, and 25 per cent of these were discharged as cured, or "disease arrested." Children to the number of 136 were returned to the regular schools, and 12 went to work. In connection with the number 136, it must be noted that a child once excluded from the regular schools can not be readmitted to such schools until the board of health gives it a clean record of health. In this 136 are also included some children who were excluded for observation and were returned as nontuberculous.

Some interesting facts in connection with these classes are the following: About two-thirds of all the children admitted were taken from classes in the first four years of school life.

Four of the five schools report that 316 children gained in weight, 34 lost in weight, a few showed neither gain or loss, and, in five cases the weight was not recorded. A girl of 13 made the greatest gain in weight, viz. 38 pounds in nine months; among the boys 22 pounds was the record gain.

Among the children, who gained in weight, the average for the girls is a little higher than that for the boys; among those who lost, the average for the girls is somewhat greater than that for the boys.

Ten degrees Fahrenheit was the lowest temperature recorded in any of the classrooms during the year. It was registered in the classroom on the roof of the Vanderbilt clinic during the month of December. The lowest average temperature for the months of December, January, February, and March was 29° F.; it was registered on the ferryboat foot of East Ninetieth Street. The highest average temperature was recorded in Public School 37, Brooklyn, on the ferryboat *Susquehanna*.

About 59 per cent of the pupils admitted to these annexes had pulmonary tuberculosis in the first stage, about 15 per cent in the second stage, and about 4 per cent in the third stage; the others had latent pulmonary tuberculosis,

tuberculosis of the glands, or were held for observation because they were doubtful cases.

The teachers are told that the health of the child is the main consideration, and that school work must be sacrificed to gain it. A child physically incapable of keeping up to grade, unless it exerts itself more than its physical condition will permit, is not allowed to make the effort. It is a pleasure, however, to report that the majority of the children hold their own while in these classes, and that some of them do better work than they did in the regular schools.

The equipment, cost of feeding, character of feeding, clothing, rest, recreation, medical supervision, and so forth, have been so often described[3] that I will not enter into the consideration of these subjects here. Suffice it to say that it pays in the end in health, happiness, and economic gain to take care of these tuberculous and tuberculously predisposed children at the right time and in the right place.

To the two types of classes for outdoor instruction (outdoor classes in regular school buildings for the predisposed and outdoor schools for those afflicted with open tuberculosis) there should of course be added that type of schools which are known in Germany as "Waldschulen." These are of course mainly feasible in summer, but will be of inestimable benefit to the nervous, anemic, scrofulous, poorly nourished children, all of them strongly predisposed to tuberculosis.

A system of such "Waldschulen," or vacation schools, it should be the ambition of every city to possess. All these types of schools should be multiplied manyfold. I go so far as to say that if we really mean to wipe out tuberculosis from among the coming generation, open-air schools and open-air instruction should be the rule, indoor schools and indoor instruction the exception. If it is true, as it has been stated, that the child handicapped by so serious a disease as tuberculosis, anemia, or scrofulosis, when instructed in the open air, not only holds its own, but often does better work than the healthy child raised and instructed indoors, what may we not hope from outdoor instruction given to the healthy child throughout its school career? And, in "school career," I include a kindergarten course. This latter institution because, unless it is attached to a public school where the school physician is on guard, it rarely has medical inspection, is, to my mind, a fruitful propagating ground of infectious diseases. Most frequent of these are the mysterious colds which the little ones bring home, and which, upon investigation, it is shown that all the children have. I am convinced that the open-air kindergarten would do away, not only with these so-called colds (which are infectious), but also diminish the number of other infectious diseases to which children are so prone.

And now a word as to instruction in the open air in higher grades; that is to say, in high schools and colleges. I know, of course, that there are a number of branches in the curriculum of the high schools

and colleges which can not be taught outdoors or in an open-air class, but many branches can, and I know, from personal experience, and from the reports of army surgeons in Germany, that recitation and singing in the open air is very conducive to health, and to the development of sound lungs and a well-formed chest. Thus Barth, of Koeslin, Germany, made a careful study of the effects of singing on the action of the lungs and heart, on diseases of the heart, on the pulmonary circulation, on the blood, the vocal apparatus, the upper air passages, the ear, the general health, the development of the chest, on metabolism, and on the activity of the digestive organs, and has come to the conclusion that of all exercises singing is the most conducive to health. Considering the fact that it can be practiced everywhere (where the air is pure), or at any time, without apparatus, it should be much more cultivated than it actually is. The German military authorities, who have the reputation of instituting all exercises which tend to invigorate the soldiers, have of late years encouraged singing during marches of all troops.

Botanical and geological excursions are, I believe, not nearly frequent enough in our public schools. From personal experience I know the inestimable value of such, as far as physical development is concerned. Certain studies can, I believe, also be better pursued outdoors than indoors. The authorities of the Ethical Culture School, evidently realizing the benefit derived therefrom, make the following statement in their recent announcement of open-air schools for anemic and nervous children:

> During the fall and spring there will be frequent excursions to the outlying country for the purpose of securing country air and environment. These offer possibilities in the way of recreation, nature study, and concrete material for geography, arithmetic, and all school work.

Let instruction in the open air be carried out more universally in high schools for young men and women, whenever feasible, as well as in primary schools, and I guarantee a stronger and better race physically within a decade, with no intellectual impairment whatsoever. I go even so far as to venture the statement that if giving the course of studying mostly in the open air renders it possible for the tuberculous child to accomplish as much and more in shorter hours and shorter sessions, the hours and sessions for the normal pupil of primary school, high school, and college may also be shortened by this hygienic mode of studying and teaching.

Although I am personally opposed to home lessons for children attending primary grades, older children will of necessity have to study at home sometimes. After having spent all day in the open air they will dislike to be shut up for home study. For these children I recommend that an open-air study room be arranged at home by the utilization of some portion of the roof or porch. If the

parents do not own the house or the landlord is not gracious enough to give permission for the utilization of either roof or porch for that purpose, I suggest the following device: In front of the ordinary American window, raised from below as far as possible, place the worktable for the child. In winter he sits in front of it, warmly wrapped up, on a comfortable chair to do his lessons. Around him, inclosing table and window, is placed a large folding screen or waterproofed canvas-covered frame, with another piece to form a top, as high as the window will open. This will form a tiny room in front of the window for an outdoor study. The center of the screen should contain a celluloid window, so as not to take too much light from the room and also for the purpose of watching the child. By this arrangement the rest of the room will neither be rendered too cold nor too dark for the other members of the family. With outside shutters, which can be closed in stormy weather or at night, studying in the open air can be carried on day or evening and in all kinds of weather.

This arrangement is, of course, primarily intended for use in winter; it would hardly be necessary in warm weather.

Before discussing the second portion of my paper, referring to breathing exercises, I must say a word on the architectural side of the problem of open-air schools.

To abandon all old-type schools for new ones would be an expenditure far beyond the present financial ability of most communities. Hence the question arises, What can be done with the existing buildings, and how can we construct new schools most economically and serviceably, with a view to getting as many open-air schools as possible?

The qualifications of an expert architect and a physician versed on the subject under consideration are rarely combined in one man. I, for one, at least fully acknowledge my deficiency in architectural knowledge, and, to be of some real service to the cause, I have again consulted my old friend and fellow student, Prof. John V. Van Pelt, of the school of architecture of Columbia University, who has helped me before with his wide experience in plans for ideal sanatoria, open-air model tenements, and other sanitary constructions. I have submitted to him my ideas and conceptions of what an open-air school should be and the object it should serve. He has prepared for me some plans showing how open-air classrooms can be so constructed on the roofs of existing school buildings, or how any story of the building can be made to serve as open classrooms, and, lastly, he has drawn for me an ideal open-air school. I wish to thank Prof. Van Pelt for this invaluable cooperation in a cause so dear to my heart.

And now as to the value of breathing exercises, which I should like to see incorporated in the curriculum of every school, from kin-

dergarten to university, to be performed at recess and gradated according to the age, intelligence, and strength of the pupil.

I have often taken the measurement of children of tuberculous parents and of others who were brought to me because of their undeveloped physique. After a few months of exercises they almost invariably improved in general health and grew correspondingly stronger than they had been before taking the exercises. It has also been my privilege to teach respiratory exercises to physicians and students with gratifying results. The first time I published a system of respiratory exercises which I had worked out was in my doctor's thesis, "Les sanatoria, traitement et prophylaxie de la phtisie pulmonaire," which I defended before the Faculty of Medicine in Paris in 1895. I published them later in my textbook on tuberculosis, "Pulmonary tuberculosis; its modern prophylaxis and the treatment in special institutions and at home," and reproduced them in my international prize essay "Tuberculosis as a disease of the masses and how to combat it." I have had the good fortune of seeing the latter printed in 27 different countries and 24 different languages.

Such or similar exercises are now, I believe, practiced and taught by a goodly number of physicians engaged in the work of the prevention of tuberculosis. In Paris such exercises have been adopted in some of the public schools. Dr. Marage of that city recently published some interesting statistics showing the results of having breathing exercises practiced by a number of pupils several times every day for a period of six months. The experiments were made at the communal boys' school, in the Rue Gambon, under the control of Prof. Meunier, Madame Meunier, and a number of teachers. It was observed that the children learned the exercises easily and performed them with pleasure. There were fewer absences from school during the six months of experiments than during the other part of the year. The results were universally good, especially in sickly children.

The following is a table showing the gain of height, chest capacity, and vital capacity:

Results of series of experiments on children by Dr. Marage.

Age.	Height in centimeters.		Chest girth in centimeters.			Vital capacity in liters and centiliters.			Number of pupils.
	Beginning.	Sixth month.	Beginning.	First month.	Sixth month.	Beginning.	First month.	Sixth month.	
6 years	115	118	51	53	57	0.54	0.78	0.85	19
7 years	125	125	52	55	59	.66	.80	.93	14
8 years	124	126	53	56	60	.79	.86	1.13	27
9 years	130	132	55	59	63	.89	1.00	1.17	29
10 years	141	143	59	62	64	1.20	1.36	1.51	28
11 years	138	142	58	62	66	1.05	1.31	1.70	18
12 years	145	149	59	63	67	1.47	1.67	1.95	22
13 years	148	151	70	74	77	1.93	2.26	2.26	16
14 years	147	153	62	66	74	1.83	1.92	2.15	7

Encouraged by the results obtained by myself and others from these respiratory exercises, I have taken up their study anew and publish and illustrate for the first time in this essay a much more complete system of respiratory exercises adapted to the development of the lungs and the improvement of the respiratory system in general.

In the working out of this new and improved system of respiratory exercises it has been my aim to bring into play all the muscles of the body from the head down to the toes, including the abdominal and dorsal muscles, and yet avoid the possibility of exercising any one of the muscles too violently. Exercise H, whereby a great deal of residual air is expelled, and consequently a greater interchange of air takes place, producing a better haematosis, has given me particularly gratifying results. I have been able to increase the chest expansion in a number of young persons and children from 1½ to 2½ inches within three months.

As soon as the intelligence of the growing child will permit, it should be taught to breathe deeply, and later on be taught to take the following breathing exercises, which it should learn to love as the average boy or girl loves general gymnastics: (A) In front of the open window or out of doors it should assume the position of the military "attention"—heels together, body erect, and hands on the sides. With the mouth closed it takes a deep inspiration (that is, breathes in all the air possible), and while doing so raises the arms to a horizontal position; remains thus holding the air inhaled for from 4 to 5 seconds, and while exhaling (breathing out) brings the arms down to the original position. The act of exhaling, or expiration, should be a little more rapid than the act of inspiration.

The act of inhalation occupies about 4, the act of exhalation about 3 seconds, and, as has already been said, the act of retention of the air about 5 seconds. The child should be taught to count mentally during these three acts, so as to be systematic about holding the air. One can move the hand upward and downward twice counting four, and on the fifth second begin to exhale while lowering the arms.

Respiratory exercise A.

When the first exercise (A) is thoroughly mastered, one may begin with the second exercise: (B) Place the arms, one above the other, in front of the chest, giving the hands a position as though wanting to tear open the chest. Then hands, arms, and shoulders make a backward movement (the fingers remaining bent) while one takes a deep inhalation; then count 4 by tapping the chest four times with both

Respiratory exercise B.

Fig. 1—PORTABLE OPEN-AIR SCHOOL AT JAMAICA PLAIN, BOSTON; PARTICULARLY SUITABLE FOR VILLAGES AND SMALLER COMMUNITIES.

Fig. 2.—REST-HOUR IN AN ORDINARY SCHOOLROOM TRANSFORMED INTO AN OPEN-AIR CLASS.

Fig. 3.—OPEN-AIR CLASSROOM ON ROOF OF SCHOOL BUILDING.

Fig. 4.—FOREST-SCHOOL PAVILION AT CAMP ALGONQUIN.

hands, and at the fifth second start to exhale, bringing the hands and forearms into the position from which they started. This exercise has the advantage that it can be taken in the sitting position, or even when lying on the back.

The third exercise (C) consists in raising the arms from the sides to the horizontal, and then above the head, taking a deep inhalation during this act; then bending backward as far as one can and remaining in that position 4 seconds while retaining the air (counting the seconds by moving the hands alternately forward and backward twice), and on the fifth second exhaling gradually while resuming the original position. During this exercise it should be borne in mind that when the arms are raised until the hands join one should not bring the arms close to the head, but rather form a circle above the head by bending the arms outward enough so that the meeting of the index fingers and thumbs form a triangle.

Respiratory exercise C.

The fourth exercise (D) is for the purpose of bringing the abdominal muscles also into play, or, in other words, combining abdominal and chest breathing. To this end one assumes an erect position, as in the beginning of all the exercises, the hands meeting in front with the little fingers and the edge of the palms touching the abdominal muscles. While taking a deep inspiration, raise the diaphragm, concentrating all attention on this act; and, while doing so, move the joined hands upward, sliding them along the thorax up to the chin; then turn them and continue to raise them until they are above the head. Bend backward during the four seconds, while retaining the air, and then exhale, lowering the arms gradually to the horizontal, and to the original position of "attention."

Respiratory exercise D.

The fifth breathing or respiratory exercise (E), which may also be called a dry swim, requires more strength and endurance. It should not be undertaken until the others have been practiced regularly several times a day for a few weeks, and until an evident improvement in breathing and general well-being has been observed. One takes the usual military position of "attention," and then stretches the arms out as if in the act of swimming, the backs of the hands touching each other. During the inspiration one moves the arms outward until they finally meet behind the back, remaining in this position for the usual four seconds, counting while moving the

Respiratory exercise E.

hands and while retaining the air, and on the fifth exhale bringing the arms forward again ready to start for another swim; or, if this is the end of the dry swim, the arms return to the original position of "attention."

This somewhat difficult exercise can be facilitated, and be made more effective, by rising on the toes during the act of inhalation and descending during the act of exhalation.

Respiratory exercise F.

It will be seen that, with the aid of these five respiratory exercises, every muscle of the body is put into play. The face alone is at rest, and can serve as an indicator that the exercises are properly done, for it must be borne in mind that they must be taken without any undue tension of the muscular system, and tremorlike movements must be avoided.

In time, the desire for deep breathing will be constant. Of course, when out of doors, one can not always take these exercises with the movements of the arms without attracting attention. Under such conditions, one can assume quietly a position similar to "attention," and perform exercise (F). Raise the shoulders, making a rotary backward movement during the act of inhaling; remain in this position holding the breath for four seconds, and then exhale while moving the shoulders forward and downward, assuming again the normal position. This exercise (F) can be taken easily while walking, sitting, or riding in the open air.

Some girls and boys, especially those who are predisposed to consumption, often acquire the habit of stooping. To overcome this the following exercise (G) is to be recommended. The child makes his best effort to stand straight, places his hands on his hips with the thumbs in front, and then bends slowly backward as far as he can during the act of inhaling. He remains in this position from four to five seconds, while holding the breath, and then bends forward again, somewhat more rapidly, during the act of exhalation, assuming the original position with hands on hips.

Respiratory exercise G.

The following general rule concerning breathing exercises should always be remembered: Commence with the easier exercises (A), and do not begin with the more difficult ones until the former are completely mastered. Take from four to six respiratory exercises, one of (A), (B), (C), (D), (E), (F), or, when outdoors, simply exercise (F), four to six times every half hour or hour, or at least four to six times a day, and on rising in the morning and retiring at night. Continue this practice until deep breathing has become a natural habit. These exercises should always be taken in an atmos-

phere as fresh and as free from dust as possible. Never take these breathing exercises when tired, and never continue so long as to become overtired. We repeat once more the important injunction that the muscles of arm and forearm or any of the other muscles should never be on a tension during the respiratory exercises, but rather relaxed, so as to avoid the expenditure of unnecessary muscular energy.

These exercises are, of course, destined for children who are not as yet tuberculous, and they should be taught gradually and according to the strength, development, and understanding of the child. It must be evident that these exercises, which I believe are of incalculable benefit as a means of helping a child to overcome a tuberculous predisposition, are not indicated in all cases. They can do harm if the child is very delicate and not judiciously advised and guided in the gradual development of its physique in general. They will never be harmful in the healthy child if not overdone. Children, as a rule, take kindly to these exercises, and their love for fresh, pure air and distaste for foul air becomes very strongly developed. There should be no fear that in so-called flat-chested children the bony structure will not yield to the pressure exercised from within. Thus, with the aid of such respiratory exercises, a flat or hollow chested child can develop into a good, strong, broad-chested man or woman.

Besides the above-described exercises, there is one more which the older child, particularly after having learned all the other movements, can add to them, as a means to develop his chest by taking in the greatest possible amount of pure, fresh air. To this end, he takes exercise (H), which is accomplished in the following way: He takes the usual position of "attention," then inhales deeply, rolling the shoulders upward and backward, holding the air for four seconds, and, on the fifth second, exhales all he possibly can, assuming again the original position; but before again inhaling he makes a second expiratory effort, while turning his arms outward (movement of supination), and pressing the inner side of the upper arm against the chest; thus, so to speak, he squeezes out all the air there is left in the lungs. A vacuum or emptiness in the lungs is thus created, and the pupil involuntarily takes a very deep inhalation, after that assuming the ordinary quiet position of "attention."

To show the value of this exercise, let me repeat here that during ordinary inhalation and exhalation—that is to say, quiet respiration—the amount of tidal air inhaled is only 500 cubic centimeters, the volume which can be inhaled by the first exercise is 1,500 cubic centimeters, and the volume which can be exhaled by this exercise is about 1,300 cubic centimeters. When, now, by the second expiratory effort, aided by the supination of the arm and pressure against the chest, 500 cubic centimeters more of reserve or residual air can be

expelled, the value of this exercise before going to work, at recess, and on return from work, or whenever one is environed with fresh, pure air, must be evident.

I hope what I have said in the foregoing may have helped to convince the pedagogues, the physicians, parents, and the general public what open-air schools, instruction in the open air, and breathing exercises could do for our children and what immeasurable benefit in sanitary, intellectual, moral, and even financial gain would accrue to the nation.

According to our Constitution every individual community has to take care of the education of its children, and the wealth, the number of children, and the density of population in general is unequally distributed. As a result many communities, poor in resources but rich in children, can not offer to their future generations the facilities for getting that mental, physical, and moral development to which they are entitled by reason of being the children of a great, free, and rich country.

What a field for doing good lies here before our wealthy, well-meaning fellow citizens. To help the poor communities to have ideal schools, with ideal open-air classes, to provide poor and undernourished children with nutritious food, to help the poor communities to attach to every one of these schools a physician and social worker, the latter to work with a view to aid the truly needy and to prevent pauperization, would bestow a blessing upon future generations the magnitude of which is beyond calculation.

According to the report of the Commissioner of Education, there are at this time about 20,000,000 children attending public schools in the United States. Placing the percentage of tuberculosis among them only as low as 3, would make 600,000 tuberculous children who are at this time in urgent need of open-air instruction. According to the above-mentioned statistics, we have provided at this time instruction in open-air classes for 1,755 tuberculous children. The anemic, the nervous, the children suffering from cardiac diseases, who are in equally great need of outdoor instruction, are not included in the 3 per cent.

Many of these children, who are not properly treated because of nonrecognition of their disease, or lack of facilities to treat and cure them, must die during school life, but not before they have cost the community and their parents thousands and thousands of dollars for education and maintenance. In a paper recently read before the New York Medical Society, entitled "Primary sources of tuberculous infection, their relation to eugenics, and the cost of tuberculosis,"[4] I estimated the average duration of the life of the 50,000 children who die annually from tuberculosis in the United States as about 7½ years, and, figuring the cost to parents and community, per life, at only $200 per annum, the financial loss thus

represented is $75,000,000; and these children have died before they have been able to give any return to their parents and the community. What a useless sacrifice of life and of money. What a useless cause of sorrow and heartaches to parents. And all because we do not take care of the child at the right time, and do not educate it in the right place. How much there is to do, and how little is as yet done.

[1] Primary sources of tuberculous infection, their relation to eugenics and the cost of tuberculosis, New York Medical Journal, June 29, 1912.

[2] Open-air Schools, L. P. Ayres, Ph. D.

[3] Ayres, L. P.: Open-air schools; Doubleday, Page & Co., New York.

Baginsky, Adolf: Ueber Waldschulen und Walderholungsstätten; Zeitschr. f. päd. Psy. Path. u. Hygiene, 1906, vol. 8, pp. 161–177.

Bryce, Dr. P. H.: Open-air schools and preventoria; Med. Review of Reviews, August, 1909, New York.

Carrington, Dr. Thomas S.: How to build and equip an open-air school; the Survey, April 23, 1910, New York.

Crowley, Ralph H.: The open-air-recovery school; Chap. XIV of the Hygiene of School life; Methuen & Co., 1910, London.

Floyd, Cleaveland: Care of phthisis in children through the outdoor school; Amer. Jour. of Public Hygiene, Nov., 1909, pp. 747–751, Boston, Mass.

Grau, Dr. H.: Ergebnisse und Bedeutung der Waldschule; Centralblatt f. allg. Gesundheitspflege, 1906, Heft 11–12, pp. 373–480.

Hyams, Isabel F., and Minot, Dr. James: Boston's outdoor school; Journal of Outdoor Life, July, 1909, New York City.

Morin, Jeanne: An open-air school in France; the Wide World, December, 1909, International News Co., New York.

Perkins, Dr. Jay: The Providence fresh-air school; Outdoor Schools, August, 1909, Boston Association for the Relief and Control of Tuberculosis, 4 Joy Street, Boston, Mass.

Spencer, Mrs. Anna Garlin: Open-air schools; International Congress of Tuberculosis, 1908, vol. 2, pp. 612–618.

Wing, Frank E.: Report of Chicago's first outdoor school and its results, the Chicago Tuberculosis Institute, 158 Adams Street, Chicago, November, 1909.

[4] New York Medical Journal, June 29, 1912.

DISCUSSION.

Dr. Leo Burgerstein, Vienna Austria: In the United States, many plans have been tried for the establishment of open-air schools. In some instances, an entire floor has been converted into a single open-air schoolroom. Open schools are conducted throughout the year, the children in winter being provided with warm clothing, and adequate protection for the feet.

C. Ward Crampton, M. D., director of physical training, department of education, New York City: We are all in general accord with the increase of the number of out-of-door schools. The present necessity of providing for children living in increasingly congested localities prohibits the present general adoption of this excellent plan. In the great school building of to-day, with its 48 to 72 class-

rooms, we have adapted ourselves to conditions so abnormal that a "return to Nature" would be undesirable if it were not impossible. We may open the whole area of one side of the classroom, but this will not ventilate it. At times the exposure to wind and weather is dangerous to pupils and at other times the air is stagnant. This is not adequate ventilation. We must accept the situation and develop our system of mechanical ventilation till every child is bathed in air of the proper variations of temperature and humidity, air which is not only as good as the average that Nature provides, but as good or better than may be provided by natural means.

Dr. Maximillian P. E. Groszman, Plainfield, N. J.: Open-air schools will have an effect upon the rational development of the course of instruction in addition to its effect upon the general health of the pupils. They will assist in breaking down the traditional artificial standards. To tie the children down to desks in the old three R's system of reading, giving half the time to reading and the other half to writing, would be an abomination and an absurdity in an open-air school. Open-air instruction will give back to the child his birthright, viz, to develop through motor activity, through exercise, through doing, rather than through books and symbols.

Another thought suggested by Dr. Knopfs's remarks was that the "wealthy fellow citizens," who, he thought, could do so much to further these child-saving reforms, should be present at these meetings and listen so as to learn. But they are usually conspicuous by their absence.

SOME FUNDAMENTALS OF THE HYGIENE OF THE TEACHER.

Grace N. Kimball, M. D., Poughkeepsie, N. Y.

In presenting a paper on this subject to a scientific assembly it is proper that at the outset I should announce that in the limits necessary I can only bring to your attention some considerations that seem to me to underlie the well-being of the teacher. I can not adduce particulars or statistics to prove my theses. Moreover, and for the same reason, I shall consider the subject only as it refers to women as teachers.

In the course of rather extensive professional relations with large numbers of women in the teaching profession my observations confirm me in the opinion that the most prevalent physical disabilities among them are those that have a nervous origin. The various manifestations of neurasthenia, insomnia, gastrointestinal neurosis, pelvic disturbances (largely of nervous origin), neuralgia, neuritis, eye strain would probably constitute 75 per cent of the chronic disorders of the women in the profession. Uterine displacements complicate pelvic neurosis in a large number of cases.

These being the facts, any inquiry into the hygiene of the profession should look to the causes of this predominance of neurosis.

I. THE HYGIENIC VALUE OF THE SOCIAL ESTIMATE.

The quality of the service rendered to society by the teaching profession is a fundamental determining factor in human progress. The social estimate of the importance of this service underlies the elaboration of the profession in a very direct and basic way. In the first place, the higher the social estimate the greater the power given to local school boards and governing bodies. This means more of efficiency and less of politics in the selection of these bodies. It means higher ideals of service. It means that boards of education shall command more liberal financial provision for the work, thus insuring the perfection of equipment and the highest grade of instruction obtainable. In the second place, the higher social estimate has a direct and powerful influence upon the general efficiency of the teacher, and in particular upon the hygiene of the teacher. As the air which her professional being breathes must be the comprehension that her work is received and valued as essential to the well-being and elaboration of the individual and of society, in a degree not exceeded by that of any other profession or human influence. She will never be efficient in the highest degree, and rarely, in the long run, physically at her best, unless she withstands the enormous demands of the day's work by the sustaining sense of the value of the service she is rendering society. Society expresses this estimate by its established ideals, by its provision of material equipment, and by the scale of remuneration.

II. THE HYGIENIC VALUE OF HIGHER STANDARDS IN THE SELECTION OF TEACHERS.

The movement in many States toward a pedagogic standardization of the profession, comparable in some measure to that of the medical profession, demands greater elaboration. The large and rapidly increasing output of women's colleges provides society with a wider choice and a possibility of higher standards than the world has ever known. The first fundamental consideration as affecting both the efficiency and the hygiene of the teacher is personal fitness. This determines success in all professions. But in no profession is it more important for success and well-being than in that of pedagogy. Nor is any essential so impossible to standardize. And yet the ideal of personal fitness should be high; for we do easily what we do well, and we do well that for which by nature we are fitted. This is one of the fundamentals of the hygiene of the teacher. Hence, with the large and rapidly increasing number of college-bred women, the greatest discrimination should be exercised to select the naturally fit. The requisite education and financial need have been largely the determining factors of the past. An increasingly higher and more critical standard must prevail in the future. We may elaborate systems of hygiene and mechanical devices therefor,

but, after all, there is no controlling factor so strong as the essential individual and her outlook on life and work.

Given, then, the sense of the social value and dignity of the profession, and the natural fitness for it, there is also the fundamental demand for a longer, more elaborate, and more deliberate preparation for teaching than our present economic conditions seem to permit. The standard that is being rapidly reached in divinity, medicine, and law will naturally be attained in pedagogy, namely, the liberal arts education, followed by a standardized professional training.

Assurance of adequate preparation gives a poise and ease of performance that has direct and pervasive hygienic values. An incalculable amount of physical damage is done in the teaching profession by the nervous reactions of physical unfitness and of hurried, crammed, and insufficient preparation. This is especially true of teachers in the lower grades, because of the common but fallacious belief that any person who has passed through the school grades demanded by the boards of education is thoroughly prepared to teach in the same grades. The unprepared and undeveloped mind reacts upon the body, and usually there is no one wise enough to detect the subtle morbid influence. When the path of knowledge runs too near the precipice of ignorance, the nervous tension is too great. A genius may say, "By dint of teaching the subject for many years, I finally arrived at some slight understanding of it." But a public-school teacher in the grades should have a clear and adequate knowledge not only of her subject but of correlated subjects before she begins to teach at all.

Again, higher physical standards in the selection of teachers are both necessary and possible.

The teaching profession is one which demands definite hours, consecutive days, exposure to the weather, considerable physical strain, and prolonged nerve tension. These conditions are not to any degree under the control of the individual teacher. Therefore there is the hygienic necessity for some standard of physical fitness that may be comparable to the standards established for officers in the Army and Navy. Physical training, athletics, and hygienic supervision, as now elaborated in the best of our colleges for women, make insistence upon physical and nerve strength possible.

In every community there should be a competent board of medical examiners, who should investigate with thoroughness and skill the physical fitness of every applicant for the position of teacher. Re-examination at suitable intervals should be made to insure the maintenance of proper standards, with especial attention to the detection of and elimination of tuberculosis. Moreover, there should be a great awakening of conscience on the part of the ordinary medical practitioner in relation to the exclusion from the school of teachers suffering from communicable diseases, and especially from tuberculosis.

III. THE HYGIENIC VALUE OF PROVISION FOR THE TEACHER'S WELFARE IN SCHOOL CONSTRUCTION, EQUIPMENT, AND ADMINISTRATION.

Given the hygienic importance to the individual teacher of assured dignity and social value of her vocation, personal genius for it, and a higher standard of selection. we come to the need of more definite and liberal provision for the teacher's convenience, comfort, and efficiency in the construction and equipment of our schools. The school is the teacher's office, study, place of business—not a mere workshop. I submit that in the vast majority of even our modern schools attention is almost entirely given to arrangements for the convenience and welfare of the pupil—very little to the legitimate demands of the teacher.

Since the larger part of the working day is spent in the quarters provided for her by the school authorities, the teacher's conservation of energy, her effectiveness, her protection against physical damage, depend largely on the degree in which she has been considered in the construction and equipment of the school. The convenience, comfort, beauty, and even luxury of the modern business office are an acknowledgment of the sentiment that the place in which one works must conduce to one's doing one's work well. The growth of the same sentiment in regard to the construction and equipment of schools will equally conduce to the well-being and efficinecy of the teacher, and can be made—should be made—to conserve her energy, give working facility, affort aesthetic satisfaction and a sense of official dignity, and thus contribute to the hygienic maximum.

Under present conditions the teacher has no private office, no study in the school where she does the large amount extra-sessional work of preparation and of inspection of pupil's work that form a part of her duty. It is the exceptional teacher who has in her home a proper and comfortable study. Her dignity of office demands at the hands of the community a suitable place in which to work. The bedroom or the family sitting room are unsuitable; neither is the common schoolroom suitable. After the pupils are dismissed the remaining work of the day should be completed in an environment of privacy and comfort, conducive to physical rest and mental satisfaction. This work is in the vast majority of cases at present carried home to be done in the confusion of domestic surroundings or in a cold and cheerless bedroom. The teacher's work should be done in her office, and left there.

Even with our greatly improved schoolroom arrangements, there still remain other evils arising from the custom of considering only the pupil. More attention should be given, for instance, to grouping the pupils so that the teacher may obtain the best possible command of her school audience, and that, too, without the necessity of constant standing. The physical tax of prolonged standing, under

all physiological conditions, is a waste of energy—mental as well as physical. Again, the arrangement of lights in the schoolroom must give equal accommodation to both teacher and pupil. In brief, all the details of construction and arrangement should be scientifically considered in the interests of the teacher, in order to be in the highest interests of the pupil.

In matters relating to the administration of the school, the hygienic efficiency of the teacher may be greatly advanced. Spontaneity, enthusiasm, reserve force, quiet nerves are essential assets of the successful teacher. These pedagogic forces are weakened or withdrawn in proportion as the individual is surcharged with the toxins of fatigue. Prolonged periods of classroom work, especially in lower grades and in large classes, bring about rapidly such toxaemia, with its inevitable physical lassitude and nervous irritability. An important provision in the day's program is that of insuring a sufficient number of short intervals of relaxation to allow for the elimination of fatigue toxins. This might involve the employment of proctors who should visit each schoolroom in turn and provide both relief to the teacher and relaxation to the pupils equally in need of it.

The pressure which is continually felt toward overcrowding our schools should be more and more vigorously met by a counterpressure tending to reduce the number of pupils allotted to each teacher. The hygienic ratio between output and intake of personal force should be scientifically adjusted. The dilution of personality is at present too great—an irreparable loss to the pupil and a stultification to the teacher. Extra-sessional work to some degree counteracts this dilution, but the advantage comes to those least responsive to it—the dullards and the miscreants. And it is more than questionable whether the cost is not too great to the teacher. The removal from the mass of pupils of the backward and deficient children will have important hygienic value to the ordinary teacher.

The ever-increasing demands made upon teachers for clerical work, as well as the development in our schools of social work, may again suggest the employment of more teachers in proportion to the school population to guard against the overwork and confusion of mental processes entailed. Nothing could be more inimical to mental spontaneity or more productive of toxic fatigue than long hours spent in correcting papers, making up averages and statistical reports. Much of this work could be profitably delegated to nonprofessional employees, and the inestimably valuable public asset of mental vigor and nerve poise of the teacher be conserved for the development of her higher functions.

Participation in the social work of the school—mothers' meetings, house visitings, and personal relations with the pupils—should also be met with a corresponding reduction in the amount of actual

teaching required and in the number of pupils dealt with by each teacher.

The hygienic conservation of the teacher depends to a certain extent on the supply system. The system should be elaborated, so that teachers may not be obliged to be on duty at times and under circumstances when they can neither conserve their own health nor render adequate service in their classes. With higher standards, as suggested, the average teacher should be able to teach through the entire month, but occasional exceptions to this rule, otherwise well fitted, and exceptional occasions in the usually normal individual will occur. Many transient indispositions render this supply system doubly valuable when we consider that the colds, influenzas, throat affections, etc., which constitute the majority of their indispositions, are usually of an infectious character and should be excluded from the school in the interests of the pupil. The teacher suffering from coryza, tonsilitis, pharyngitis, and influenza should be expected to absent herself from school, not as a privilege, but as a duty, without financial loss.

IV. THE HYGIENIC INFLUENCE OF THE PRIVATE LIFE OF THE TEACHER.

The position of women in extra-domiciliary industry is a new one. The process of adaptation to this new position is still going on and has not kept pace with the demands for such service.

The man goes to his employment, receives his compensation, provides for his daily necessities, buys his clothing, and grants himself such physical comforts and recreations as he considers his due. He does not know how to cook his own food, to set his own house in order, to do his own washing and mending, or to make his own clothes. He knows how to earn the money by which he may have these things done for him; in reality, they are often done largely by unpaid labor. And society recognizes the imperative necessity that the man's earning power should be adequate for the purchase of this service. He has neither time, strength, nor inclination to perform these for himself.

Not so the woman wage earner. She knows how to do all these things. For untold generations it has been her work to do them. Her atavistic tendency is to do them still. Moreover, her compensation, with its sex discrimination, is usually inadequate for the procuring from others of this service: and while having no more time and certainly no more strength than the man, she has the feminine sense of obligation toward these tasks, and she does them, often not only for herself, but for others dependent on her. Household opinion, still in the early stages of adjustment to woman's new economic condition, easily allows, if it does not actually demand, the double service at the woman's hands. The comfortable personal

indulgences that the man looks forward to after his day's work have no counterpart for her. The equivalent for the after-dinner pipe has not yet been evolved.

Women must learn the masculine art of relaxation before they can reach hygienic safety. And they must reach hygienic safety and sanity in order to attain the highest executive efficiency.

The woman teacher, then, to achieve the truest efficiency must eliminate from her category of duty personal and household obligations, and activities that deprive her of the rest and recreation necessary to that efficiency. She must realize that her powers are sacred to her calling. This she can not do until the public realizes that the remuneration of the teacher is a strong factor in assuring her hygienic and pedagogic efficiency. In order to bring this about, the public must be educated to appreciate the fundamental value of the teacher's service to society and the individual, and to be willing to express this estimate in dollars and cents. Appreciation of the worth and dignity of the teaching profession, if it were expressed in money values more liberally, would not only have its absolutely direct effect upon the hygiene of the teacher, but would also give a moral elevation of great pedagogic value.

Moreover, if this were the estimate of the general public, maintained in public schools, the owners of private schools would no longer be able to unduly increase their profits at the expense of the teacher, as is now done in the large proportion of girls' schools. There are notable and noble exceptions.

Again, there is a definite hygiene bearing of sex discrimination in the salaries of teachers. A given position should command a uniform remuneration irrespective of the sex of the teacher. Injustice has distinct hygienic effects. And the teacher who has assurance of her ability, by virtue of her appointment, but nevertheless because of the accident of sex, bears the indignity of smaller pay, will inevitably harbor an enemy at the core of her self-respect and sense of justice which will have its physical effect. This is not a question of whether her lower salary is sufficient for her maintenance; it is a question of common justice and a *quid pro quo*. Moreover, it is my belief and experience that quite as many women as men in the teaching profession have others dependent upon them for support.

While an equalization of remuneration would unquestionably be a fundamental condition of improved hygiene, both by its moral effect and by its easement of physical conditions for our women teachers, it would be open to the economic danger of displacing women from the profession and attracting more men to it. But experience shows that women will always predominate in pedagogy, by virtue of the inherent maternal instinct with all the peculiar traits of character and adaptations of temperament that the instinct carries with it. And society will inevitably more and more benefit by this extension of the

maternal function to the children of the state. When we truly realize the paramount value of this extension of the maternal function, and when the teaching profession receives the crown of true valuation and dignity, the hygiene as well as the consequent efficiency of the teacher will have passed to new altitudes.

DISINFECTION OF NOSE AND POSTERIOR NARES.

JOHN J. CRONIN, A. B., M. D., Department of Health, New York City.

For the past 18 months I have been paying attention to a subject that I think is worth while.

In the matter of the port of ingress of germs of disease there is so much written that often I have been struck with the notion that where so many explanations are necessary there is no real knowledge.

When the mouth and the nose are considered side by side, there are certain striking facts brought to the surface. Considering these facts, with the knowledge we have of the conditions necessary for the growth of germs, I think it may be reasonably certain and to the point to make certain deductions.

Generally speaking, each specific germ requires a specific medium in which it will grow. The conditions of this medium must be heat, moisture, reaction, and pabulum, and a reasonable degree of quiet. Given a clean mouth, these conditions do not prevail. Therefore, it may be concluded that germ development does not prevail in a clean mouth. By mouth I mean buccal surfaces, gums, teeth, and anterior surfaces of the anterior pillars, soft palate, and uvula.

The tonsils may be considered *pari passu* with the mouth, and further, the fact that the tonsils have no direct lymphatic drainage render them, as primary foci, highly improbable.

If we further consider that the mouth is in a state of constant mobility, the mouth as a primary focus of disease is still more an improbable focus of disease ingress.

What an unclean mouth does may easily be conjectured. An unclean mouth is always associated with hypersecretion of saliva, which is usually swallowed. Saliva will interfere with perfect digestion, and, with a condition of salivation, the chances are that the amount of saliva in the stomach is more than the permissible minimum.

As a direct sequence, therefore, the body nutrition is interfered with, resistance lowered, and the presence of germs usually means the onset of disease if the person is otherwise susceptible.

Consider further the fact that, after all, very few people breathe through their mouth when they are in places of exposure.

It seems scarcely possible that any germ life can exist after digestion. Therefore, if the place, media, conditions, and probability of

the presence of germs may be considered reasonably wanting, that place may legitimately be discarded as an important portal of invasion for specific germs.

On the contrary, with the nose and posterior nares, the very factors that render it improbable that the mouth is an imporant portal of invasion of contagious diseases are here so classically present that the conclusion must be sustained that the nose and pharynx are the most important, and, probably, the only place conducive to the growth and development of disease germs and their invasion, to cause systematic infection.

THE ANATOMY OF THE NOSE.

The anatomy of the nose gives the most direct suggestion; that is, the most important portal of ingress of disease-producing germs. The nose, made up as it is of 14 bones of peculiar spongy type, covered by a very sensitive mucous membrane, lining the numerous fossæ and each fossa contiguous to important organs and supplied with abundant nerves, common and specialized; supplied with plexus of veins and arteries and finally supplied with the richest and most delicate lymphatic system, would seem to have been so constructed that it would be the special spot by which infection must enter the general constitution.

PRODROMATA OF CONTAGIOUS DISEASES.

If analysis of the prodromal symptoms of each and every contagious disease is made, it is noted that all prodromal symptoms are presented in the nose, eyes, and pharynx.

As exemplifying the favorableness of the nose as the essential focus of contagious disease, probably more objectively than any other, measles may be chosen.

Recently it has been established that before the onset of measles inspection of the buccal mucous membrane reveals certain pearly spots. These spots are located about the area of well-known lymphatic vessels. It is a well-known therapeutic fact that heat and moisture will determine the onset of the cutaneous measle rash, but the general cutaneous eruption does not obtain until the body is sufficiently charged with toxic products and the emunctories are overworked and local irritations set up in the skin.

It is a well-known fact that the primary site of any infection shows the characteristic of the disease some time before the other areas of the body. So in measles the nose, posterior nares, and mouth provide all the elements for development of local manifestation of measles and show the evidences of the disease at a time when the general cutaneous surface is not involved.

It is also well known that the lymphatics draining the primary site of infection are the first to become swollen and tender. In all contagious diseases the lymph nodes of the anterior cervical region are the ones first involved.

The conditions of environment are such that the specific diseases producing germs are distributed so freely and liberally that it would be rare indeed if the specific organism of any contagious disease may not be recovered from a culture taken from the posterior nares. The meteorological conditions are such that local congestions and injuries of the nasal mucous membrane are produced readily and repeatedly. There is no other mucous membrance that is subject immediately to the effects of meteorological conditions, and there is no other mucous membrane that so passively accepts, receives, and retains offense as the nasal mucous membrane and its contiguous parts. There is no cavity of the body where dirt is allowed to remain without the application of cleansing fluid as the nose, except it may be the external auditory canal. The amount of labor necessary to cleanse the nasal cavity is too great for the efforts of the ciliated epithelium, especially so in cities.

There is no organ of the body about which there is so much ignorance and to which less educative endeavor is applied to overcome this ignorance than the nose. During certain seasons of the year disinfection of the nasal cavities and posterior nares and pharynx is mandatory. At all seasons of the year it is a very cleanly habit to irrigate these chambers to rid the parts of incrusted débris and allow proper functions to operate.

Disinfection of the nares and pharynx is best operated by the following means: A 2-quart container, to which rubber tubing of proper length is attached, is filled with warm water, and two teaspoonfuls of salt is dissolved in the water. The container is hung about 4 feet above the head, so that the water runs into the nose under a 4-foot high pressure. One end of the rubber hose is put in either nostril and the water allowed to flow in one nostril and out the other. The usual precautions against blowing the nose must be observed.

During seasons of the year when contagious diseases are prevalent, instead of salt, the liquor antiseptic (U. S. P.) should be used.

Needless to say the operation should not be attempted except after demonstration and advice of a physician.

School nurses should be thoroughly drilled in the modus operandi, and all school children showing nasal secretion, congested eyes, or blocked nose should be referred to the school nurse, who will apply the remedy and continue its use in the school.

All children of a class where contagious disease has been should be treated by this means at least once a day until the period of incubation is over.

Instructions in nasal hygiene should be given to the children in the homes where contagious diseases exist by the visiting nurses, that the other children may avoid the danger of contracting the disease.

While enough practical evidence has come under my own observation to warrant the belief that contagious diseases may be limited by this procedure, and while the theoretic deduction seems sensible and sound, no application of this procedure has been tried on a large scale.

The school children of any large city provide plenty of material, and inasmuch as no harm can be done if no real results are obtained, it seems therefore befitting that a trial of the scheme should be had for the possible great good that may ensue.

DISCUSSION.

C. WARD CRAMPTON, M. D., Director of Physical Training, Department of Education, New York City: I wish to correct certain errors of the preceding speakers. The board of education (not the board of health) in the city of New York has in its employ two physicians, who give a thorough medical examination to all applicants for teaching positions. This has been the practice for over 12 years.

Moreover, all applicants for admission to the city's training schools must pass similar examinations two years before they apply for license to teach.

Furthermore, all applicants for admission to training schools must, upon application, furnish a record of physical examinations made during their high-school course. This record contains a notation of all diseases and defects, with the steps taken to remedy them, with evidence that the applicant has or has not been able to engage in the vigorous gymnastic work required in the high schools.

Before licensing a candidate we have at hand the record of six years of observation and hygienic care, and, in addition, give the routine physical examination.

ON THE OCCURRENCE OF SYPHILIS AND GONORRHEA IN CHILDREN BY DIRECT INFECTION.

ABRAHAM L. WOLBARST, M. D., New York.

The subject of this paper, though it applies directly to children, has a distinct and immediate bearing on the men and women of the future, for the diseases we are about to consider do not leave their young victims without a lasting heritage.

Of the two diseases we are about to deal with, as affecting childhood, syphilis is the only one which may be transmitted to the child, *in utero*, as a constitutional taint. The manifestations of hereditary syphilis are known to all, and do not concern us at the present moment. We shall devote ourselves exclusively to the study of these diseases as acquired by direct infection. By direct infection I mean the infection of a child, born healthy, with the active principle of the disease, either through negligence or with vicious intent.

Gonorrhea is the more common of the two diseases, both in the adult and in the child. This disease may attack an infant at birth or immediately thereafter, usually selecting the mucous membrane of the eye as its nidus. The infection is carried to the infant while it is passing through the vaginal canal of the mother, which has previously been the seat of the disease. As the infant passes through the parturient canal, pressing with its head against the walls and putting them on the stretch, the vaginal secretion containing the infectious gonococci, among its other bacterial flora, is squeezed into the infant's eyes and there sets up an acute inflammation. Any mucous surface may be attacked; and there are not a few cases on record in which the genitals of female children were involved, with the production of a typical vulvo-vaginitis.

During the past decade much has been said concerning the occurrence of gonococcus ophthalmia in the infant, with its attendant blindness. Let us give this subject a moment's consideration, in view of its well-nigh unbelievable frequency and its terrible consequences. From the standpoint of child hygiene, opthalmia neonaorum of gonorrheal origin is perhaps the most important single factor we have to deal with. First, because of its great frequency—it is said to occur in about 1 in 200 of all births, rich as well as poor; second, because it is the most common cause of blindness: Fully 25 per cent of all the cases of blindness in the world to-day are said by responsible authorities to be due solely to gonococcus ophthalmia; thirdly, because it is largely preventable, and usually curable, if proper measures are adopted in time to avoid permanent damage.

In his classic work on this subject [1] Stevenson showed that about two-thirds of all cases of ophthalmia in the newly born are due to the gonococcus. In the United States alone, according to the last

census, there are fully 7,000 men and women who owe their blindness entirely to this disease.

The exact time of inoculation of the infant's eyes with the infectious maternal secretion is not known, but it may occur at any moment after the rupture of the enveloping membranes. In a few cases the inflammation is well advanced at birth, but it usually does not make its presence known until 12 to 48 hours after birth. Cases are recorded in which the children were born with well-advanced destruction of the cornea of both eyes, and Phillips [2] mentions an extraordinary case in which the eyes were found infected and filled with pus when taking the child from the abdominal wound after Cesarean section. It is not stated whether or not gonococci were found in this pus.

Bathing the infant soon after birth has been the means of transferring the infection to the eyes. Unless extreme care is employed, the infectious vaginal secretion adhering to the skin of the infant's body may be washed into the eyes, thus producing the inflammation. Such a bath surely merits the term "*Giftwasser*," applied to it by Schirmer.

In all the mass of evidence as to the awful nature of this infection, the important thing for us to remember is that much, if not all, of this blindness and consequent misery can be prevented. Prophylactic measures were first suggested by Crédé, of Leipsic, in 1882. During the three decades that have passed, eyes innumerable have been saved from perpetual darkness by this method of prophylaxis. Its value may be judged by the statistics offered by Kösling. In 17,000 cases of childbirth, in which preventive measures were not used, 9.2 per cent of cases of ophthalmia neonatorum developed; on the other hand, in 24,000 cases, in which the Crédé method was employed, the percentage of cases of ophthalmia was reduced to 0.65 per cent; surely a convincing argument in favor of the method. Nevertheless, in spite of the teachings of bitter experience, there are still 25 per cent of our blind who have been permitted to become so through carelessness or negligence.

STANFORD LIBRARY

Here, then, lies a great field of endeavor for the humanitarian—the abolition of blindness through the universal adoption, by law or by custom, of the Crédé method of prophylaxis.

Next in importance, though greater in frequency, is the occurrence of gonococcus infection of the genitals in children. It is far more common in girls than in boys, and for obvious reasons. The anatomic arrangement of the female genitals, especially in childhood, presents a soil that is highly favorable to infection from without, and this alone would appear to account for the greater frequency of the infection in girls than in boys. Another plausible reason is perhaps found in the fact that the tendency for adult males to tamper sexually with female children is greater than for women to have relations

with male children; hence the greater risk of infection. In female children, infection spreads rapidly from adult to child, or child to child, by the mere handling of toys, wash cloths, towels, urinals, etc. Anything, in fact, that comes in contact with the child's genitals may carry the infection.

It should be borne in mind, however, that every case of vaginitis or vulvovaginitis is not necessarily caused by the gonococcus, but it should be looked upon with suspicion and the diagnosis positively made; for even though the gonococcus may not be detected in the early stages of the infection, the purulent discharge increases and the specific bacteria appear after several days.

This disease is not limited to the children of the poor, though filth and congestion are favorable factors in its causation; it may be found among the well-to-do as well, in boarding schools, and in private homes. In these instances the infection may be brought into the home by maids and nurses or playmates. R. E. Kimball, speaking of this feature of the disease, states that one of the worst cases of gonorrhea he ever saw was in a child 8 years of age, and was acquired in a fashionable school in New York.

Among the poor, where crowding and congestion and lack of privacy are synonymous terms, the disease is almost endemic. Stella,[3] refers to the occurrence of gonorrhea among the little children of the Italian population of New York and laments "the hundreds of young girls of 5 and 10 reeking with pollution accidentally communicated to them through bedding and towels and lack of sanitary conveniences in overcrowded tenements;" and Charles H. May wonders that gonococcus infection of the eye is not more frequent, in view of the frequency and persistence of these genital affections in female children. It is quite likely that eye infection is rather unusual in these cases, owing to the fact that the virus reaches the eye in a somewhat attenuated form.

Children who sleep in the same bed with the mother are frequently the victims of infection. Here we have a link in a vicious chain, which deserves our most serious consideration. The immigrant reaches this country alone, as a rule, leaving his wife and children in Europe until such a day as he shall have established himself firmly in his new home. In the meantime, likely as not, he is infected with gonorrhea; and when his family arrives to share his prosperity, his faithful wife is made to pay the penalty in the form of a gonococcus infection from which she rarely recovers entirely, and which she often transmits innocently to her children. In a study of this subject made in one of the largest hospitals in this city I was enabled to show [4] that about one-third of 1 per cent of all the male immigrants who applied for treatment in its dispensary were suffering from venereal disease, mostly gonorrhea, acquired during the absence of

the wife. Ultimately the wife and children are infected, and thus the endless chain progresses.

In institutions and asylums the gonoccocus infection has often run riot and assumed terrible proportions. Not alone the genitals, but other parts of the body, are affected. Kaumheimer[5] has dwelt on the occurrence of rectal gonorrhea in young girls, the result of contagion by direct infection from the vaginal discharge. The symptoms of this condition are often so slight that it passes unnoticed, but he expresses the opinion that this may be the means whereby the infection spreads so rapidly and insidiously in hospitals, institutions, and asylums where many children are congregated. He also wisely suggests that, on this account, the temperature of a child suffering from genital gonorrhea should never be taken *per rectum*. His data have received full corroboration through the earlier observations of Flügel,[6] who found the rectum involved in 11 of 56 cases of vulvovaginitis, or 20 per cent. In adults the proportion is greater—about 30 per cent.

These children are also apt to be crippled for life, when arthritis supervenes as a complication of the vulvovaginitis. In 1905, Holt found 26 cases of gonorrheal arthritis, single and multiple, in the Babies' Hospital, New York, in a period of 11 years. He states, in this connection, that "a pyemic arthritis in a young infant, I believe, is much more frequently due to the gonococcus than to the streptococcus or any other pyogenic organism."

Nor is this the most serious complication to which these little victims are endangered. Inguinal adenitis and abscess formation are not unusual; less common, fortunately, is the occurrence of an infection of the peritoneum, local or general, with the grave possibility of a fatal termination. Sterility in after life may also follow the infection, particularly if the uterus and the tubes have been involved.

Lastly, I wish to mention a source of infection in young girls which is of considerable sociologic importance. I refer to that form which follows sexual contact with adult or youthful males. This phase of the subject has been carefully studied by Pollack, of Baltimore, with startling results. She reports 184 cases of gonorrhea in young girls varying in age between 1 and 15 years. She estimates that there must be from 800 to 1,000 such cases each year in the city of Baltimore, these figures being considered a conservative estimate. She believes the cause of most of these outrages upon children to be due to the superstition among many people that a person suffering with gonorrhea or syphilis may get rid of the disease by infecting another person of the opposite sex, preferably "an untouched virgin." Thus a defenseless child is the most natural victim. She does not agree with the oft-expressed view that these attacks are the result of sexual perversion. In her cases nearly one-third of the victims

were between 3 and 6 years of age. This superstition is quite prevalent in many European countries and among the southern negroes, and is alluded to in the works of Havelock Ellis and Kraft-Ebing as a prolific cause of sexual attacks on young children.

The reported experience of W. T. Gibb, physician to the Children's Society of New York, is of interest in this connection. In 15 years he examined over 800 girls, ranging from 8 months to 16 years of age, on whom rape and other crimes had been committed. Almost 13 per cent of all the children examined suffered from venereal disease—10 per cent had gonorrhea, 2½ per cent had chancroids, and the remainder had syphilis. The rarity of syphilis was probably due to the examination having been made but a short time after the commission of the crime, when the time elapsed had been too short for the characteristic symptoms of the disease to appear. He believes that the number of cases seen by him is but a small proportion of the actual number of such crimes, as the great majority of children never tell what has happened to them.

In boys gonorrheal infection is far less common than in girls. Infection spreads with less facility, owing to the anatomic reasons above mentioned, but once the infection has been established, the victims are subject to all the dangers and complications that have been previously discussed. It has been my privilege to study 41 cases of gonococcus infection, in boys ranging in age between 18 months and 14 years, as follows: Two years or under, 5 cases; 4 to 7 years, 17 cases; 8 to 10 years, 4 cases; 11 to 14 years, 15 cases. The largest percentage is found among boys between 4 and 7 years, and those between 11 and 14 years. The former age is the more favorable for the practice of the superstition already mentioned, and the latter includes the boys who are old enough to have learned the possibilities of the sexual function and the means of its gratification. In one of my cases the victim was a boy of 4, who was "assaulted" by a precocious girl of 12, who was found to have attacked and infected many young boys of the neighborhood; she had previously been infected by a youth of 20. A somewhat similar case is mentioned by Wilson.[7] A boy, aged 9, was infected with gonorrhea by a girl, aged 12. On examination, the girl was found to have gonorrhea. The infection seemed to be prevalent among the younger children in the neighborhood, and further investigation revealed, as its source, a woman of public affection and of nymphomaniacal tendency.

Still more serious, in my opinion, because far less excusable, are the cases of young boys, infected with gonorrhea in public hospitals, through the use of unclean catheters. I have seen 11 such cases. These children were sent to the hospitals for various diseases of childhood, and in the course of their illness it was necessary to empty the bladder with a catheter. In this manner, gonococcus infection

was carried to these innocent children, with dire results. This is nothing short of a criminal act, which ought to be unheard of in a civilized community. This form of infection can be done away with by the simple expedient of using a new catheter for each new patient. The Supreme Court of Washington (Helland *v.* Bridenstine) recently decided that damages may be recovered for alleged malpractice, consisting of the use, in and on the plaintiff, of unclean and unsterilized instruments, whereby the disease of gonorrhea was communicated to the plaintiff. This leads me to wonder whether these victims by catheter infection in hospitals could not also recover under this ruling of the court.

In boys the disease is apt to run a more virulent course than in girls. Arthritis is more common, as is shown by the figures of Holt, above quoted. Of the 26 cases of gonorrheal arthritis 19 were in boys and 7 in girls; most of the cases reported by Kimball were also found in boys.

Coming now to the subject of acquired syphilis in children, it is apparent that this form of the disease is quite unusual, though not rare. It is not so readily transmitted as gonorrhea, and those who suffer from it are not always in the infectious stage. Pollack, in the paper referred to, saw 36 cases in girls with the double infection of gonorrhea and syphilis. Seven were in the primary stage and 29 in the secondary. Stella, also quoted above, tells of "the many mothers of the poor, who take children from institutions to nurse them, and who have been inoculated with the poison of syphilis;" and he further mentions a case, in his own experience, where the infection was not recognized on account of its extra-genital origin, and was communicated by the mother to four of her children, her husband, and a sister.

Some years ago I saw a frail little Polish immigrant boy, not more than 2 years old, with a primary lesion on the lower abdominal wall; secondary symptoms which were present made the diagnosis unmistakable. It has also been my fortune to see recently a little boy of 5 who had a typical genital chancre, with extensive secondary symptoms. How these children are thus infected it is difficult to say, but surely there must be some way of saving them.

To recapitulate: Children are frequently the victims of gonorrhea and (less often) syphilis; girls are more often infected than boys; the infection spreads with great rapidity, and assumes a terrible virulence when introduced into hospitals, asylums, and schools; girls are often the victims of perverts and superstitious immigrants trying to rid themselves of their own disease; complications sometimes follow, which are far more serious than the original disease, among these being blindness, arthritis, proctitis, adenitis, peritonitis, and sterility in later life; congestion, crowding, and lack of privacy lead to precocious sexual knowledge and facilitate the spread of infec-

tion; the male immigrant is a frequent agent in carrying infection to his wife and children; children are often infected in hospitals through unclean catheters; they are subject to all the dangers and complications of the adult; both sexes are equally liable to infection with syphilis, but it seems to be more frequent in male children; lastly, the combined effort of intelligent men and women having the welfare of childhood at heart is needed to combat the unfortunate conditions that make these diseases possible; suitable prophylaxis and attention to hygienic principles can minimize to a marked degree the disastrous effects of syphilis and gonorrhea in children.

[1] Ophthalmia Neonatorum, Its Etiology and Prevention. Trans. Obstet. Society of London, 1905, xlv.

[2] N. Y. Med. Jour., July 23, 1912.

[3] Med. Rec., May 2, 1908.

[4] N. Y. Med. Jour., Oct. 16, 1909.

[5] Münch. med. Wochen., May 3, 1910.

[6] Berl. klin. Wochen., Mar. 20, 1905.

[7] Buffalo Medical Journal.

SEX INSTRUCTION AND HYGIENE OF BOYHOOD.

Dr. Elias G. Brown, Director of The Mountain School, Allaben, N. Y.

You and I, and indeed every person, must in some way or other come more or less in contact with boys, and we are, most of us, for one reason or another, more or less interested in boys. We therefore wish for our own sake, or for the boys' sake, to understand them.

The boy, if he grows to be a man, will do so because of the working within him of that force which we call life, influenced by a special fluid, manufactured in his body, which distinguishes him as male. Therefore we should understand the sex nature and development of the boy and his proper sex education and care.

Primitive people paid considerable attention to fundamental sex matters, and sex instruction occupied an important place in their education of boys. The American Indian taught his boy from infancy up, openly and honestly, the mysteries of nature and trained him in self-control and right living. The Indians were in consequence a people remarkable for their physical strength and endurance. In the white races modern civilization has developed the wonderfully inventive brain. But with this change from the physical to the mental there has come a degeneracy which is noticeable in a large proportion of the people, marked by lack of health, strength, and poise, and caused by, among other things, a bad sex life. This condition is attracting the attention of the physician, the educator, and many thoughtful parents, forcing upon us the necessity of arranging a better mode of life, based upon right principles, especially in regard to sex, because of its fundamental importance. To

do this, the facts must first be known—what is wrong and what is right—and then we must teach the truth and train the young right.

As my work has for a number of years past been especially with boys, I shall, in here discussing the important subject of sex, attempt only to make a contribution concerning sex matters in relation to boyhood—males under the age of 20. The material upon which this study is based is from three sources: (1) Personal experience with a large number of boys of all classes and from widely different places (foreign born living in New York City, and poor, middle, and well-to-do classes native in New York City, and boys from city, town, and country from many sections of the United States); (2) the statements made to me personally and by letter by many medical men; and (3) two intensive questionnaires I have recently conducted. Where I give figures they will be in percentages deduced from these two questionnaires.

This study will be taken up along three lines:

1. Conditions that exist.
2. What can be done to teach boys the important truth.
3. A consideration of the training of boys in right living.

The medical man can of course study sex matters without embarrassment. In studying boys we can not think of any part of them as naturally unclean, and in talking with boys we therefore need have no feeling of embarrassment, for they are young and natural, and will quickly respond to our attitude. This is my experience. But in talking with older people I sometimes find it different, because some people either can not or have not learned to look at sex except as something peculiar. Although this paper will come before many who are not physicians, I shall hope that all can study with me without embarrassment a subject that is interesting, important, and should be clean, and I shall speak without reserve.

CONDITIONS THAT EXIST.

To many who are acquainted with the conditions, the setting forth of them here may seem unnecessary and even a pity; but as many others who are interested in boys and should know are not aware of the facts, I feel that the facts should be presented.

One of the first things the young man hears when going into physical training for athletics is that he should give up bad sex habits. The boy will hear it sooner or later. It is generally recognized among young men and boys that most of them have bad habits. Very often such habits are boasted of. It is usually thought that such habits show strength, but it is not usually claimed that they give strength. Young men and boys, though they so often abuse their strength and health by bad sex habits, nevertheless feel that both sexual indulgence and masturbation are detrimental to athletic prowess. Athletic trainers of young men—the majority of them—and physicians

who see much of young men speak of the great prevalence of bad sex habits among young men and boys, and state their belief that continence is not only compatible with health, but conducive to the best health and strength. When using the term "continence" I shall always mean abstinence from sexual excitement—both sexual intercourse and self-abuse, or masturbation. My statistics show the following:

Frequency of masturbation.

Age of commencing.	Per cent.
Under the age of 10	2
10 (quite a number commence at 10)	7
11	3
12 (many commence at 12)	13
25 per cent commence under 13 years of age.	
13	8
14 (greatest number commence at 14)	21
54 per cent commence under 15 years of age.	
15	12
16	6
17	5
18	4
19	1
After the age of 20	1
Uncertain as to age (would probably be distributed between different ages)	7
Total number admitting masturbation	90

This table shows that nearly 90 per cent commit self-abuse before the age of 20. Other figures I obtained some years ago gave me a slightly higher percentage. The above table is made up of statements of young men between the ages of 20 and 30. It is fair to conclude that the figures are conservative, as (if any did not answer truthfully) probably not so many admitted masturbation as denied it. I do not believe there is much difference between the so-called better class of boys and boys of the poorer class in the percentage of those who masturbate.

I have also obtained the opinions of many physicians on this subject, and their opinions vary but slightly, some of them saying that they think 10 per cent would be a liberal estimate of the proportion of boys reaching the age of 20 without ever having masturbated, others placing the percentage still lower, and some saying that they believe 0 per cent, or practically that, would be the truth.

My statistics show the following as to—

Causes of masturbation.

Influence.	Per cent.
Older boy or boys (under 20 years)	27
Boy or boys of same age	17
Spontaneous (self-taught)	24
Men over age of 20	5
Bad associates (no age or sex given)	4

Influence.	Per cent.
Older girls or women	3
Miscellaneous	3
Licentious books	1
Physical causes: Morning need to urinate, irritation of penis, poison ivy and consequent irritation, riding horseback, sliding down a pole	6
Total number admitting masturbation	90

EFFECTS OF MASTURBATION.

Concerning the actual effects of masturbation, it is very important to know the truth.

Evidently most boys do masturbate more or less. It is not only the depraved, as some good people may believe. Moreover, the temptation is normal. We should feel sorry for the boy who has not growing strong within him these impulses which denote developing manhood. But the question as to whether or not an impulse should be gratified is another thing. Most growing boys are from time to time impelled to wild acts of many different kinds. At some time it may be the crazy desire to knock over everybody they meet. It is nevertheless not best for the boy to give way to the impulse, and he gradually learns to control himself.

There is no doubt of the ill effect upon boys of much masturbation—ill effects that are physical, mental, and moral. I shall not here rehearse the details. The ill effects may be briefly stated as largely due to undue excitement of a part of the body that has a determining influence upon the whole of the body and loss of an important fluid from the body—a fluid that should be reabsorbed by the blood from its place of manufacture and give strength and energy to all parts of the body. If the boy or young man is harmed in this way, his whole vitality is lowered, and he will more readily contract disease of different kinds, or he may simply drop off in health. He is himself usually more or less aware of what is going on. He needs help. He should have had the help years ago that he might have been fortified. But do not make the mistake of frightening a boy when in this condition. Some of the worst effects I have seen from self-abuse have been due to fright and worry. The boy who gives way to masturbation is truly to be pitied. But we need not fear for the boy who strives against it and is moderately successful. The ill effects of occasional masturbation have been very much exaggerated, whereas they are slight, if any. I hope I shall not be misunderstood, for I believe we should aim at perfect self-control.

The question has often been asked as to whether circumcision will tend to keep a boy from masturbation. In my series of cases, 7 per cent had been circumcised, with the following result:

EFFECT OF CIRCUMCISION.

Two per cent circumcised say they did not masturbate.

Five per cent circumcised say they masturbated, nevertheless.

To look further into the matter, we may group these cases as follows:

Some operated on in childhood nevertheless later commenced to masturbate.

Some who had commenced masturbating were operated upon, but continued masturbating.

My general experience, before I began to record the cases, also makes me feel that circumcision is of no special value in preventing masturbation.

CONCERNING SEXUAL INTERCOURSE BY BOYS AND YOUNG MEN BEFORE MARRIAGE.

	Per cent.
Did not answer	24
Denied ever having had sexual intercourse before marriage	43
Acknowledged it	33
Said they were under 20 years of age	26
Had sexual intercourse first—	
Before their sixteenth year	7
At age of 16	6
At age at 17	7
At age of 18	4
At age of 19	2
Before the age of 20	26

Of the 24 per cent who did not answer, it is fair to assume that some of them did have sexual intercourse. It is also possible that some of those denying it did not tell the truth. It is therefore probable that the actual percentage would be somewhat above 26 per cent. The predisposing cause was almost always attributed to the influence of companions (male or female), and to curiosity or the desire for new experiences. Rarely was it attributed to sexual desire. It would, of course, be the reverse with young men after they had acquired the appetite for intercourse.

The boy led in 31 per cent of the cases.

The girl led in 16 per cent of the cases.

It was mutual in 38 per cent of the cases.

Occasionally it was said that another boy led.

Between 7 and 8 per cent say they had given up masturbating when they commenced sexual intercourse; 15 per cent of those who commenced to have sexual intercourse say they then stopped masturbating; 25 per cent did not answer this question, or said that they never had masturbated: 60 per cent of those who commenced to have sexual intercourse say they continued masturbating nevertheless.

I think it probable, from the nature of some of the answers, that some of the young men stating that they had sexual intercourse before the age of 20 did so but once. On the other hand, the custom, once commenced, is usually continued. It is undoubtedly the fact that among young men past the age of 20 considerably over 50 per cent of them have sexual intercourse before marriage.

The moral tone of different communities or groups of boys (which may be good or bad, without regard to class) undoubtedly varies very much, and makes a great difference with regard to the prevalence of this custom.

A young man sometimes says he really must have sexual intercourse—that he is fairly crazy without it. This is often apparently so; but the real cause is probably in the fact that the habit has been formed and the mode of life is not such as to help him to control himself.

There is probably no greater ill effect from masturbation practiced—say once a week—than there would be in sexual intercourse practiced by the unmarried young man with the same frequency. There is the added danger to the latter of the possibility of contracting disease.

We have no evidence to show that continence is harmful. On the contrary, there is much evidence that points to continence being beneficial in the normal boy or young man who has had early and constant training in control. And so again I say I think the ideal for boys and young men should be continence—perfect self-control.

To the statement that is often made that a young man will lose his sexual vigor if he does not exercise it, I would answer:

1. The opinion of a very large proportion of the medical men I have inquired of is that if a man reach the age of 30 (the age I set for the inquiry) and has remained continent, he should be just as virile and just as able to beget children as one who has done otherwise.

2. The observation of domestic animals, controlled with exactitude, proves the procreative ability of males continent until well after full growth has been attained.

If boys early had their ideals established in favor of self-control, and if they were trained for self-control and in hygienic ways, mentally and physically, and if their minds were satisfied with proper knowledge, then temptations would be met with a probability of successful resistance. Before the first act with the opposite sex self-restraint is more easy than after the first step has been taken. After the habit has been established it may indeed be a difficult thing to check.

I shall devote the remainder of this paper to a presentation of (1) a method of sex instruction I have used with good results with large numbers of boys, showing how it can be used by others, both for older boys, who should have had the instruction when younger, and for boys from early childhood up, as they should have it, and (2) I will outline what I consider the essentials of the proper sex hygiene of boyhood.

SEX INSTRUCTION.

Of my tabulated cases, 66 per cent say they have had some sex instruction, though in many cases it was very meager.

Received sex instruction—	Per cent.
Before age of 10	1
At age of 10	2
At age of 11	2
At age of 12	2
At age of 13	3
At age of 14	11
At age of 15	10
At age of 16	16
At age of 17	7
At age of 18	12
At age of 19	0
Total sex instruction before the age of 20	66

The important fact to be noted here is the lateness of the instruction. Whereas 54 per cent commenced self-abuse before their fifteenth year, only 21 per cent received instruction up to that time, the balance either not receiving any sex instruction or not receiving it until after they had contracted the habit of self-abuse. The unanimous opinion of the young men is that boys should receive sex instruction, and almost all remark that the instruction should be given early. An objection is often raised to giving sex instruction early for fear that it may suggest to the boy thoughts we wish to keep out of his mind and actions we wish him to avoid. But if correct instruction is not given we may be sure that the boy will either receive some instruction from another source or that his own developing nature will prompt him to thoughts and actions that he should avoid. This fact is too frequently overlooked. If proper instruction is given early enough in his life, little by little, before he comes to the age of 10, when his sexual nature will soon commence to develop, and if the boy has constant inspiration to right living, not by spoken words so much as by true example, and if he also has proper and constant training and hygienic living, then the knowledge will have been obtained be-

fore the age at which it would arouse feelings and in time for it to be a protection, and with high ideals and habits of self-control established the boy is likely to meet these strong temptations successfully.

The information a boy should receive may be placed in four groups:

1. The secret of strength. (About the boy himself.)
2. The development of life. (Plant, fish, and animal.)
3. Human birth.
4. The young man in the world. (Relation of the sexes.)

Further on in this paper I present outlines for talks on these topics.

In a summer camp these talks may well be given as part of a course in nature study. In a school the talks should be given as part of a course in hygiene or physiology. In a home the material could be easily studied and understood by a parent, and it could then be used simply to answer a child's questions, or a series of evening "talk," or, better still, discussions could be held, for instance, on "Physical training," under which would naturally come (1) "Exercise," (2) "Bathing," (3) "Diet," (4) "Rest." These discussions one should work out simply, and they will prove very interesting to most boys. Whether they are actually held or not, on giving a talk on (5) "The secret of strength," attention should be called to the fact that it is one in the series which would not be complete without it, though usually in considering physical training—exercise, bathing, diet, and rest—the subject is considered complete with these four divisions. That is why the fifth topic may be called "The *secret* of strength," because most people avoid the subject and consequently know very little about it, though upon the knowledge and proper living according to it, more largely than upon anything else in his life, depends a boy's health and strength.

A parent should answer a child's questions frankly and truthfully. It would be well to keep a memorandum of the questions asked and answered and compare it from time to time with the outline of what a boy should know. Occasionally a boy does not ask many questions. In such a case a wise parent should volunteer a little at a time. Parents often see much more in a question than a child means to ask, and therefore hesitate to attempt to answer. It is best for one to take up the subjects as definite talks with a boy soon after reaching the age of 8. Repetition of these talks from year to year will serve two purposes—as a review that will fix the knowledge, and the boy will also at each talk learn something he did not learn before.

I present here outlines of the talks as I give them. I have made all the talks simple for two reasons:

1. So that any boy may easily understand.
2. So that any parent may easily be able to give them.

THE SECRET OF STRENGTH.

The body—made up of organs.
- Organ—a part of the body set aside for a special use.
- Illustrations:
  - The heart.
  - The eye.
  - Glands— a kind of organ.
    - Excreting—to get rid of waste fluids.
    - Secreting—to form fluids useful to the body.
    - Illustrations:
      - Salivary glands.
      - Testicles.
- The testicles (use diagram).
  - Their function to make the most useful "seminal fluid."
  - Seminal fluid—reabsorbed into the system. Gives strength and energy to all parts of the body.
  - Emissions—the natural safety valve for overabundance.
  - Talk at some length on: Vigor of mind and muscle. Caused by presence in the body of this most important fluid.

Abuse:
- Of the eye, for instance, by foolish irritation, might cause blindness.
- Of the private parts, will prevent their performing their proper function, the formation by the testicles of the important seminal fluid. The whole body will therefore suffer from lack of this fluid in the body, hence the term "self-abuse" (masturbation).

Result of self-abuse:
- Moral, mental, and physical weakness. (Illustrate by examples.)
- Caused by lack of important seminal fluid in body.

Describe difference between bull and ox.

Describe a eunuch.

Tell boy plainly how different he would be without testicles.
- Describe to him why.

Tell boy plainly how he would be weaker with testicles performing their function poorly.

Describe causes that may make it hard for a boy to resist temptation.
- Company a boy keeps—Mental and physical influence.
- Things a boy sees—Pictures—Shows.
- Books.
- Wrong diet, especially stimulants.
- Tobacco.
- Lack of exercise, especially out of doors.

Recovery from weakness—Remove the cause—Nature restores.
- Warn against quack doctors.
- Speak of family physician as proper one to consult.

What helps boys resist.
- Knowledge, ideals, good companions, mental and physical occupation, and especially athletics out of doors.
- Describe the Indian boy's morning prayer to the Great Spirit while in training to become a man.

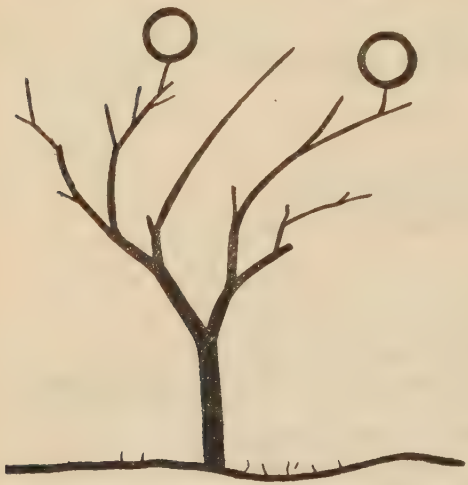


FIG. 1.—Diagram of plant containing only female flowers, to illustrate talk on "The development of life."

FIG. 2.—Diagram of plant containing only male flowers, to illustrate talk on "The development of life."

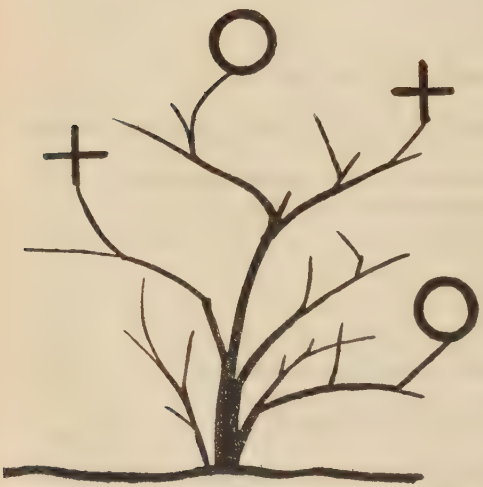


FIG. 3.—Diagram of plant containing flowers, some of which are male and others female, to illustrate talk on "The development of life."

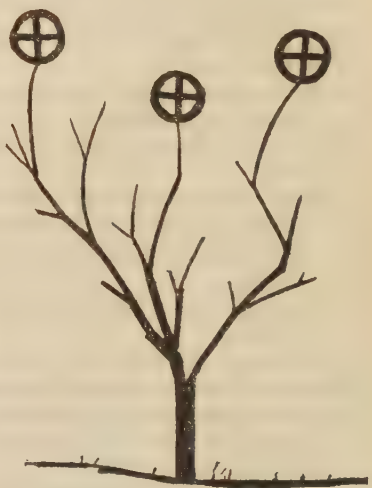


FIG. 4.—Diagram of plant containing flowers, each one of which is both male and female, to illustrate talk on "The development of life."

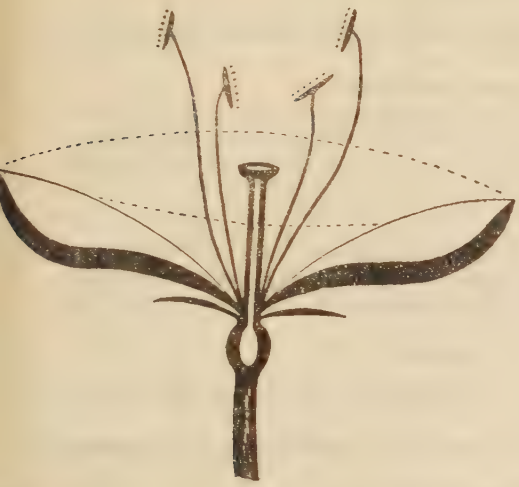
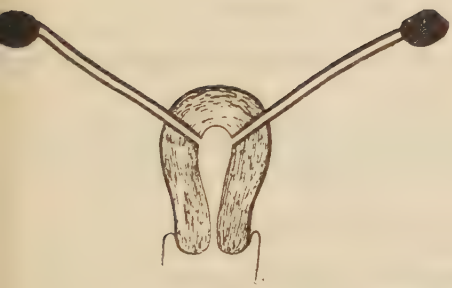


FIG. 5.—Diagram of typical flower, to illustrate talk on "The development of life."

FIG. 6.—Diagram (1) to illustrate talk on "Human birth."



IG. 7.—Diagram (2) to illustrate talk on "Human birth."

FIG. 8.—Diagram to illustrate talk on "The secret of strength."

THE DEVELOPMENT OF LIFE.

Describe a typical flower and its parts: Calyx, corolla, stamen, pistil, and ovary. (Use diagram to illustrate.)

Describe three different types of plants, as follows:

(1) Plant containing flowers, each one of which is both male and female.

(2) Plant containing flowers, some of which are male and others female.

(3) Plant containing flowers that are only male on one plant, with female flowers on another plant.

Describe pollenization—fertilization.

Describe fertilization of eggs of female fish, expelled from her body, by fluid (containing fertilizing particles, like pollen grains) from male fish's body.

State that in some animals fertilization takes place outside the female's body and in others inside.

HUMAN BIRTH.

Describe how all life originates from a single cell, the female cell joined by a male cell, causing fertilization.

Show diagram of human female body, describing parts concerned in development of young.

Impress upon boys reverence for mother's body.

Describe ovaries in which ovules are formed, periodical passing of ovules to uterus, preparation of uterus to afford a place for development of a new human being from ovule if fertilized, development of baby, and its birth.

Impress upon the boy that his health and right living will have great influence upon his own children later.

THE YOUNG MAN IN THE WORLD.

[For boys who have begun to develop.]

Review origin of life from union of male with female cell.

Warn boy against the very beginning of improper intimacies.

State plainly that having children is not a matter of marriage.

Speak strongly against unmanliness of wronging opposite sex.

Speak against shame to girl of improper relationships and of having illegitimate child.

After speaking of unmanliness of wrong to opposite sex, speak of dangers to boy.

The disgrace of having child when unmarried.

Danger of contracting disease—Gonorrhea—Syphilis (describe).

Warn boy against quack doctors.

Tell boy plainly that temptation is natural, but giving way to temptation is weakness, and dangerous.

Warn boy against little beginnings, as any notice of strange girls.

High ideals and right living should be cultivated from the very beginning. The boy should be impressed with the fact that he himself is responsible.

MENTAL AND PHYSICAL HYGIENE OF BOYHOOD.

We must not forget that our own lives will have greater influence for right living in boys than anything we can say.

We must not forget that all habits of mind and body have little beginnings. It is the beginning that is most important, therefore commence early to train.

Mental habits should be acquired of admiring strength, uprightness, and cleanness, and of liking to do hard things. The only method I know of is by giving the boy personal examples and inspiration.

The physical habits of obedience, promptness, and activity should be acquired.

Simple life should be lived by the boy. Luxurious life, preventing activity, must be avoided. Active lives and light, free clothing are essential. Cold air and cold water in frequent doses on the surface of the body is a strong help toward continence and also an almost certain preventive of colds. Free drinking of water between meals is also good. It is most important that the diet be simple and non-stimulating, and that the boy should learn not to overeat, though it must be remembered that a growing boy needs considerable nourishment. Occasional short fasting or skipping of a meal may be used to good advantage in training a boy to and showing him that he can control his appetite. It is best to do this with a boy in a natural way, as when off fishing.

Frequent nakedness in the presence of other boys (as with brothers, in the dressing and bathing rooms of gymnasiums, and at camp) and in the presence of proper men, if there is supervision—a natural and easy supervision that is not apparent as such to the boy—will result in a mental attitude that is the opposite from the morbidly curious, and that may easily be directed toward admiration for cleanness, health, and strength.

The last few paragraphs are meant merely to suggest some of the definite details that should be observed in the hygienic care of boys.

We too frequently either wish for certain results without making definite effort to attain the results, or try to attain results without sufficient attention to details.

Every boy should have definite physical training (with much more attention to details than is usually given) for two of the following three reasons: (1) If delicate, physical training will build him up; (2) if robust, physical training will turn softness into hardness, physical and mental; and (3) whether delicate or robust, physical training will develop self-control, and at the same time lessen sexual impulses, which otherwise tend to run riot.

I can not state too strongly my belief in two things: First, that boys, in order to grow up with self-control, especially in sex matters, must have, with ideals and knowledge, a very considerable amount of physical training, including really hygienic living (diet, etc.), plenty of hearty exercise in the open air, and physical discipline in the form of athletics and gymnastic drill; and, second, that for perfect physical training continence is necessary in boyhood, and, con-

versely, physical training is a very great help toward continence. By physical training we can not mean simply the development of physical strength; we must mean the development of physical power with control.

As exercise without interest is comparatively valueless, so physical training must include not only physical exercises and hygienic living, but also a knowledge of these things and ideals.

The usual way with boys nowadays is practically to let them drift. But if you wish results with any boy, he must have positive influences of ideals, education, and training.

If a dog has grown up without training, it is very hard to break him of habits formed. It is equally hard with a boy. There must be *training*, and it can not begin too early. The boy, as the dog, should have training in right habits and in obedience, but the boy should also have will training. There must be *knowledge*, for without that the boy mind will not be satisfied and his body will lack guidance. The knowledge should be acquired when the boy seeks it, and that will be early and constantly. Ideals there must be also, for without the *inspiration* of ideals the boy can not reach his best. With training, knowledge, and inspiration anything is possible for a boy.

TUESDAY MORNING, SEPTEMBER 24, 1912.

HYGIENE OF CITY INFANTS AND BABIES.

Prof. Dr. Adolf Baginsky, Königl. Friedrich Wilhelms Universität, Berlin, Germany.

When the president of Section III told me that I should present a paper on "City babies" I believed it impossible to prepare such a paper with the narrow limits which a congress allows. Consider the many valuable books on this subject which have been written by Americans, to say nothing of us "schreibselige" Germans, to whom baby life is the most precious of the nation's treasures. How can I present something new, something not known long ago in America, or not fully discussed in the American Pediatric Society? On the other hand, it is inevitable that the hygiene of city babies should be discussed at such a congress. Specialists, researchers, pediatricians, and hygienists are here from all parts of the world, and we may confidently assume that the knowledge of child nature and child life will be promoted by the mere exchange of ideas in the manifold dangers and injuries to child life under the extremely diversified conditions of climate, customs, and subsistence. It is possible in this way to turn new light on many doubtful questions and to solve some of them.

I will only mention the great question, constantly discussed, what are the causes of the greatly increased infantile mortality during the summer months in great cities, the question whether summer complaint, with the predominating picture of cholera infantum, is an infectious disease; whether it is only a disease of the intestinal tract caused by the food which so easily decomposes in children, or whether it is due to direct injury of the infantile organism by hot weather under unfavorable nutritive and living conditions. When we discussed this question many years ago (1884) at the Medical Congress in Copenhagen—my friend Jacobi will certainly remember it—there arose a most lively controversy. The speaker expressed most varied views without coming to any agreement, and to-day, in spite of numerous studies and diligent work, this important question is yet unsettled, though much has been contributed to set the question in a clearer light than we had when the science of pediatrics was still in

its beginnings. In this classical country of summer complaint it may, therefore, be of great value to know the views and experiences of representatives of various regions and of other countries. We shall not thrash empty straw when we here again discuss the hygiene of city babies. Therefore let us hope that, though many old things will be repeated, many new ideas may be developed.

When I see, year after year, the seriously weakened children pass before my eyes in the policlinic and in the hospital under my direction, when I walk with a younger colleague through the beautiful rooms of the division for infants and older children with internal diseases, if I compare in my mind this misery, the causes of which, with relatively few exceptions, are easily found, with the rounded, well-formed, and lively newborn infants when they slip from the mother's womb, one thought fills my mind—that there are only two influences, two factors, which produce, sometimes in an extremely short space of time, the grave and death-dealing change, the inability to preserve the child's health and life.

(1) Lack of means, misery with all its accessions.

(2) Lack of knowledge, complete ignorance of what is necessary to preserve the health of the newborn and to develop the powers which nature has bestowed. I do not take into consideration the relatively few exceptions, cases where the infant is born with reduced health, as in cases of congenital syphilis or other congenital defects; neither do I take into consideration cases where, from the first day, love is absent and criminal conduct endangers the life of the newborn, nor the practices of women known as "angel makers." Poverty and ignorance are the chief destroyers of child life and child health, and from these two sources flow, in swelling streams, the injurious conditions which sweep the young to destruction. Much less important are those other causes which lower the vitality of the child, as heredity or feeble vitality brought by the child into life by way of accident or unusual conditions—Poverty!

> Famine is in thy cheeks,
> Need and Oppression starveth in thine eyes,
> Contempt and Beggary hang upon thy back.
> The world is not thy friend, nor the world's law.
>
> —Shakespeare.

Can more be said in words so few? We must, above all things, take up the battle against poverty and ignorance, and this in the widest scope, if we wish to promote the hygiene and the care of the children. Both affect child life in great cities more severely than in country districts, because the living conditions are more difficult, more complicated, in large cities; because the increased needs of adults entail a more stringent limitation, reduction, and deterioration of the living

conditions of children; and because ignorance is not so far diminished as might be supposed from the generally higher civilization of great cities. Superstition and unreason are common in great cities, under different forms perhaps, but to the same extent as in the country. The influence of poverty and misery is best shown by the preponderating mortality of the illegitimate children. I will not put before you figures from all countries, for they are well known. I present only a few figures from my own country.

Of 1,000 infants born alive in the Kingdom of Prussia, there died:

	1881–1885	1886–1890	1891–1895	1896–1900	1901–1905
Legitimate	194.64	195.35	192.57	188.74	179.08
Illegitimate	351.22	258.04	357.68	355.94	330.56

Thus the mortality of the illegitimate children is 1 in 3, and that of the legitimate, 1 in 5 among the new born. Tugendreich gives almost the same proportions for the whole German Empire, namely, 19.3 deaths among the legitimate, as compared with 32.7 deaths of the illegitimate children. All writers agree in this—that this preponderating number of deaths among illegitimate children is due to their social misery, beginning with the withdrawal of the mother breast, and continuing through the impossibility that they shall be adequately cared for or properly established in life. No natural laws, says Tugendreich, in his work on protection of mothers and infants, prescribe the mortality of infants; the immediate causes are faulty hygiene, false teaching, and superstition.

If this is recognized, it shows us at once that child hygiene must begin with the improvement of social conditions in general, with the fartherest possible removal of poverty and misery, with the prevention of the injurious influences proceeding from poverty and want, and also with the removal of ignorance, inexperience, and superstition.

The child lives and subsists during fetal life on the body of the mother, in which it develops and builds up its organism. What the mother suffers in want and misery, the developing infantile body also suffers and brings with it, as defects, into the world, in spite of the provisions of nature to counteract, as far as possible, their influences. Therefore, the care for child life does not begin when the child is born, but during pregnancy. Very gradually this self-evident truth penetrates the consciousness of humanity, and very gradually humane social efforts and legislation begin to express interest in the protection and care of motherhood. Biedert, in his observations on child mortality in France, with regard to country and city, has shown that the mortality in the country districts has declined in the last 10 years at

a higher rate than in the city, which proves that preventive measures in the cities have been greatly inferior, especially as to the protection of motherhood. Therefore, we must promote the measures which are calculated to help the mothers. In cities they suffer most, partly because even the legitimate mother may be compelled to do hard work until date of birth arrives, but partly because care and want, psychical and bodily depression hang over the illegitimately-pregnant women in large cities and cause defective development of the child. The third section of the International Congress for the Protection of Infants discussed legislative and administrative measures, and Bruno, of Heidelberg, discussed insurance of motherhood, as special topics.

"No effective protection of infants is possible without adequate provision and care for the mother," is one of Bruno's basic principles, and therefore, as one of the most important requirements of legislation, he demands the establishment of motherhood insurance. He also demands that pregnant women be excluded from occupations injurious to health, that working time be reduced, and that several weeks of rest be reserved to mothers before the expected birth. Some civilized nations have begun to take up motherhood insurance, first of all, France with her "Mutualité maternelle," whose beginnings reach back even to 1714 and 1748, and whose purposes are of late years intensively and effectively furthered by Félix Poussineau. Hungary, Italy, and Austria have made laws for the same purpose, namely, to protect the mothers against want, during pregnancy and the puerperal state, by money contributions and later on by nursing premiums. Germany adopted, in 1910, a law providing for assistance of mothers in childbed and also during pregnancy. It is an inadequate law, and does not satisfy the liberal parties, but it is a foundation on which we shall be able to build in the future. The law says that only assistance in the form of attendance, of financial aid up to six weeks, nursing money to the twelfth week, medical aid, and so forth, may be granted, and at that the law is not mandatory. In America, says Bruno, there exists no protection of motherhood. I do not know if this is correct, but it was strange that none of the American gentlemen present spoke up for America, while Félix Poussineau, Vivien, Fernand, and Merlin showed the success of the "Mutualité maternelle," spread over the whole of France, in its full light, by stating that since the establishment of this social institution of motherhood insurance, the mortality of infants has decreased by 50 per cent.

Therefore, protection of mothers by way of social self-help and legislation in the form of pecuniary aid to pregnant and puerperal women during a period of at least six weeks, and in the form of social-hygienic care, together with nursing premiums for several weeks or months, according to the necessity, are measures which we should

promote in the interest of the hygiene of city babies. Concerning nursing premiums, I add a few explanatory remarks because I omitted to mention the reasons for it.

Nature supplies in the secretion of the mother's breast a means of overcoming the evil effects of poverty and want. I do not want to sing here the praise of mother's milk. Far back in the earliest years of civilization social writers praise the feeding of the infant at the mother's breast. We may only read Tacitus, who praises the German women. Plutarch, Soranus, and all the others down to the present day have repeated the same thing, that for the child all blessings flow from the maternal fountain provided by nature. On the other hand, we hear complaints about the refusal of these blessings under the influence of a civilization which ignores nature. Therefore the same phenomenon repeats itself, that with progressing civilization the discussion of maternal nursing makes its periodical appearance. At present we have again entered such a period, and only those who do not know history will think that it is the recent times κατ' ἐξοχήν, which have invented the arguments to prove that women should nurse their own babies. This question has always existed; it has been neglected or forced into the background again and again, and yet has risen again with irresistible power. In one thing our times surpass the earlier ones, namely, that under the force of circumstances the possibility of the mother giving the child her breast has very much decreased, though not entirely disappeared. But here not poverty nor want are the deplorable factors; on the contrary luxury, pride, false notions, vanity, and frivolity are the motives to repress the highest of motherly duties. There is only one remedy; to awaken the sense of motherly duty by the spoken and written word.

But with regard to the mothers whom poverty and want prevent from performing their motherly duty, it will be the task of social endeavor and legislation to assist them, and, for the great majority of women, this can best be done by nursing premiums, either in the form of money, food, or boarding institutions. For this reason nursing premiums are placed on an equal basis with motherhood insurance. With these, and with protection of numbers of the poorer classes, we have gained a strong point, in that it has been made possible to provide for child hygiene, a thing impossible without funds, for here, as in all branches of hygiene, every progress demands money, and again more money.

Considering the further development of hygienic postulates from the viewpoint of modern science another important point impresses itself upon my mind as of at least equal importance with the amelioration of poverty and want as they affect mothers and children, namely, education and training of mothers in the care of their chil-

dren. It is useless to supply means, or to relieve need, if mothers do not know how to make a proper use of the means furnished. We frequently find that children in the well-to-do families, under most favorable circumstances, are badly cared for, decline, and finally perish, because all knowledge of child care is lacking. No experienced practitioner will deny this. When I learned this from years of observations I took occasion, when the German Empress initiated in Berlin a movement among the women for the protection and care of infants, to suggest an association for the purpose of establishing small, well-regulated schools for the training of women who would devote themselves to the social task of caring for children and who would be educated as teachers.

Women thus trained might go out among families and teach mothers how to take care of their babies. The instruction would cover all matters of general hygiene, all questions of cleanliness and ventilation of dwellings, prevention of infection, and so forth. This undertaking was at once approved and supplied with funds, and many of my pupils and assistants gladly offered themselves as instructors for the women who would take the course. It was intended that the women thus instructed should pass a simple examination and obtain a certificate of their ability to teach mothers who were in need of instruction. Carefully as it had been planned, and energetically put into practice, the undertaking failed for want of earnestness in the execution. Some of the women regarded the course of study and the examination as sport, and I soon found women who did not know more about the care of children after the course than before, and who thought their common sense quite sufficient. Foolishness, superstition, and prejudice were sometimes carried away and communicated to mothers who needed assistance. Thus the undertaking failed; I can not tell if it will be taken up again. The question of maternal instruction had to be attacked in another way. The fact that in almost all European countries a certain preparation, a certain test, is necessary for the practice of any profession, and without which no professional work is sanctioned by the State, led to a demand that women seeking employment in the care and education of children should have a certificate of their ability. If in Europe no teacher, no tradesman, no physician, no lawyer, can practice his profession without having passed an examination, there is surely no reason why a woman should be permitted to practice a profession which is of high public importance, namely, to care for children, without even an effort to acquire the necessary knowledge. Thus we come to the introduction of instruction in child care for mature young women. We hear much at present about the necessity of sexual education. But the education of the young women in the duties and tasks of motherhood is much more im-

portant. It should be impossible for a girl to become a mother without having the least idea how to rear, feed, and care for a baby, and how to protect it from disease.

I therefore demand—and this is the second important postulate regarding child hygiene, not only in cities but also in the country—that the young girls receive a compulsory course in school on the care of children and on the whole field of child hygiene.

Thus we would establish another important foundation for child hygiene with unmeasured blessings for the families spared from grief and misery, needless expense, and anxiety; benefits, also, for the State, in great numbers of well-developed, healthy, and efficient citizens who, likely to have perished, have been happily preserved.

And now we may consider what ought to be taught in these courses for young girls:

(1) The importance of bodily cleanliness, bathing and clothing, necessary information regarding temperature, protection of the child against heat and cold, the necessity of keeping the child dry, and so forth.

(2) The knowledge of nutrition, beginning with the immense importance of the mother's breast for the whole future life of the child, the care of the milk bottle, of the milk, and so forth; knowledge regarding the quantities of food to be given, protection against underfeeding and overfeeding, the difference between carbohydrates and albuminous food, and so forth.

(3) Division of time of the day for the child, necessity of sleep and waking, time of giving food, necessity of fresh air, and so forth.

(4) The knowledge of the dangers of infection, with special consideration of the most important children's diseases, their origin, transmission, and so on. All this in a simple, popular form, adapted to the minds of the lower classes.

(5) Reeducation out of false notions, superstitions, and foolish legends concerning the care of children (for instance, the false belief in dangers from teething, the belief in the evil eye, and in charms against it, the nonsense of amulets, and so on).

Thus education would establish a foundation on which the care of children could be well developed.

The advancing growth of the child brings into view the question of its proper sustenance, as far as it may be affected by poverty of parents or of mothers, and especially of illegitimate mothers; legislation and social endeavor must now take up the task and protect the helpless child. Let us first consider the more needy, the illegitimate child. We are fully informed as to the poverty of illegitimate mothers and as to the frequency of illegitimate fathers who shirk their duty. Some countries do not compel the illegitimate father to perform his full duty, but demand merely that he shall

maintain his illegitimate child. I remind you of the law of the French code which forbids to "chercher la paternité." It is different in Germanic countries. There the rights of the illegitimate child have been better and better established during the last two decades. In recent years they find their best expression in the appointment of a legal guardian. This is called the Taube system, after the Leipzic pediatrist, Taube, who fought energetically for its introduction. According to this system a legally constituted authority looks after the interests of illegitimate children, energetically compelling the illegitimate father to do his duty. This system at once does away with the poverty of illegitimate children and creates a certain safeguard for their proper bringing up. But it ought not to be carried too far, and the illegitimate child should not be granted privileges to the disadvantage of legitimate children who may be born later—i. e., illegitimate children born before marriage must not take away the means of subsistence of later born, legitimate children. The legitimate later children must not suffer on account of the illegitimate children. With this limitation the Taube system of a legal guardian must be unreservedly approved, and may be considered as a third important postulate for the hygienic care of children. Another question is that of the permanent hygienic supervision of children who are cared for in private families and private and public institutions. Our times have accomplished much good in this field, as the supervision has been taken away from the merely administrative and executive authorities and has been placed in the hands of medical officials, who are assisted by a staff of specially educated male and female helpers who protect the children from injurious influences, giving timely attention when sickness occurs and providing for their transfer to a hospital.

The hygienic care of these city babies is thus assured. This institution inevitably requires the establishment of children's, and especially of infants', asylums, where helpless children find a home, not only at the infantile age, but sometimes at a more advanced age. Municipal children's asylums—whether children are kept only for a short time and then transferred to private families or whether they are kept for a long term—must be provided with all the apparatus, rooms, and halls which modern child hygiene demands. In this manner, the illegimate children are better cared for than the legitimate children of poor families. But here, where the duties of parents are rightly placed in the foreground, social endeaver has stepped in to assist the needy and provide them with instruction, and thus a very important work has been accomplished. The collective social effort for the child, splendid as it is, has made a great impression in recent times, and has here, in fact, found its great tasks, which are performed in widely different ways. In a short review I may mention:

(1) The institution known as "Gouttes de Lait," first established for infants, but gradually extended to older children. These institutions are maintained under the direction of enlightened physicians, and furnish the poor pure food, milk, etc., assist poor mothers with nursing premiums in money and food, keep the children under constant supervision, give advice to mothers, and render medical aid in cases of slight sickness.

How extensive the work of these offices is may be seen from the fact that the city of Berlin spends annually $75,000 for these offices, distributed throughout the city. This movement, originally starting in France, has gradually extended over the whole civilized world, and has assumed a complete international character, as is shown in this congress.

(2) The establishment of children's homes (Kinderkrippen), charitable institutions, where children of the working people are kept and cared for while the parents are at work. These homes are used, like the "Gouttes de lait," for the instruction of parents, and thus contribute to hygienic progress. These are hygienic institutions intended for legitimate children; their establishment is recommended everywhere, but especially in cities having a large working population.

We can thus formulate a fourth postulate for the hygiene of city children. The State and municipal provisions for illegitimate and legitimate children must be accompanied by correlated institutions of social endeavor, by the establishment of "Gouttes de lait" and offices for the advice of mothers and the introduction of children's home for the working population.

We have now considered the infants and have said something about older children. What are the hygienic needs of the older children, who have passed beyond the infantile stage? I have lately pointed out, in a lecture on charitable institutions for children in great cities, what is needed in order that the advantages secured in infancy may not be lost in childhood; I have also had occasion to point out how remiss we are in the care of children immediately before the school age (3 to 6 years). The State, the communities, and social workers are in arrears with respect to these children, not only because little is done for them, but because what is done is done in a wrong way—here too much, there not enough. I therefore demand the establishment of a central office in every city for the proper distribution and use of the means furnished. Through such a central office every city will be able to do good work, and yet also to guard against abuse, and to bestow on just those who need it the necessary hygienic care and supervision.

What are, then, the hygienic needs of these city children? They may be measured and estimated by the injurious influences, with

which children are threatened in city surroundings. All social disadvantages, want, and poverty and misery affect city children more severely than country children. But surroundings free from poverty and misery, and even surroundings which allow a certain amount of comfort and prosperity, are not free from dangers to health and life. It is true the rich are the few in the city as well as in the country; for the upper 10,000 no charitable institutions and protective measures are needed; for them, instruction and education are sufficient, as the rich are able to protect and help themselves.

The evil influence of city surroundings are very numerous, and hard to define and mention separately. The most important ones are these:

(*a*) Deterioration of the air by smoke, dust, dirt in the street, and in the dwellings.

(*b*) Crowded dwellings, when too many people have to live in a narrow space, and so lack necessary air space; this is the more injurious, the greater the lack of ventilation.

(*c*) Lack of sunlight and, at the same time, excessive heat during summer in dwellings and streets.

(*d*) Lack of open places for free exercise, and, in many cities, the lack of proper provisons for skating, bathing, and swimming in the open.

(*e*) The direct dangers of city traffic.

(*f*) The increased danger of infection from contagious diseases by close contact of children in school and in their homes. To this I add a number of psychical dangers, if I may so call them.

(*g*) The dangers to the mind from excitement; street noise, music, and pleasures, the social precocity in family and society (societies, dancing, and the like), with all the dangers of precocious development; in poor families, early morning work, and overwork.

(*h*) Immediate exposure to the use of alcohol and to sexual indulgence.

Such are the dangers which beset children in the cities, and it is necessary to take a stand against them.

It is clear that we should have to traverse the whole field of hygiene in order to take up in detail the hygiene of dwellings, of schools, of child work in factories and at home, of the street, and of social life. I will only allude to them, and take up a few for the sake of discussing hygienic measures against them.

If we pass over the important infectious diseases, as whooping cough, diphtheria, the acute exanthematous fevers, which in great epidemics may also threaten country children, we find that it is above all the chronic diseases, as rickets, scrofula, tuberculosis, and anaemia which especially affect the city children. The number of rickety children, for instance, can not be established with certainty, but this

much is known, that among children of the middle classes, who were not fed on the mother's breast, a great many are affected with rickets, and among children of the lower classes rickets is still more frequent. In other great cities of Central Europe conditions are no better. Similar conditions were reported years ago from Vienna. What has been said of rickets is true of anaemia. Really healthy-looking red-cheeked children are, I will not say rare in great cities, but by far less numerous than among country children. I do not want to exaggerate, for, on the whole, conditons are not so bad, as we might a priori expect. It is true that conditions are improving under the influence of hygienic measures and institutions, which are gradually being established, and of which I shall say more later on. They have been introduced in a great number of cities, among which Berlin may be mentioned especially. The spread of scrofula and tuberculosis, however, is still extensive. I have before me statistics gathered in Berlin by Albert Kohn in 1911 for the annual meeting of the central committee for the prevention of tuberculosis.

These statistics show that the children of 196 tuberculous parents of the working class who belong to the Mutual Sickness Insurance Association, were also affected with tuberculosis. From the examinations by means of the tuberculin reaction (Pirquet, Moro) it was found that in cities like Berlin, Vienna, Paris, where tuberculosis is very common, the reaction was positive in 51 per cent among children of 2 to 4 years, in 66 per cent among children of 4 to 7 years, and even up to 84 per cent among children of 7 to 14 years. It is probably the same in all great cities of the world—here a little less, there a little more. But the early infection of the children is an established fact, and just as well established is the fact that the children are infected on account of the crowded living conditions in the cities, so that, as I have said, years ago, tuberculosis is a disease of crowded dwellings. Here then we recognize, in a few instances, casually mentioned, the influence of city surroundings on the causation of disease and sickliness among children. What measures are then needed to to improve the hygienic conditions? Again it would be necessary to fill a book, nay, a number of books. The school hygiene, which I published, fills two rather large volumes. Hospital hygiene has been the work of my life, and many hundreds of writers, among them not least the Americans, have made it their life work to plan improvements in hygiene, and to put them in practice. Thus only the most important points can be mentioned:

(1) The improvement of living conditions of city dwellers by practical hygienic building, by the prevention of crowding, by strict supervision and legal enactments.

(2) Keeping the streets clean from dust and dirt by frequent washing and sprinkling.

(3) Eliminating the smoke nuisance in cities by means of apparatus for burning the smoke.

(4) Good school buildings and their hygienic supervision, open-air schools for sickly children whose condition permits instruction in the open air, besides proper changes in the plan of studies, of instruction, and of feeding the poor children in school; the appointment of medical inspectors for all schools; the establishment of large playgrounds.

(5) Establishment of bathing places, especially of swimming baths, carefully and hygienically conducted.

(6) Establishment of open-air sanatoria, vacation colonies, sea and ship sanatoria for sickly children, by which it is possible to keep these children away from the city for several weeks.

(7) Careful supervision and legal measures for combating acute infectious diseases by compulsory notification, disinfection, and so forth; and last, but not least, general and compulsory vaccination and revaccination.

(8) Prevention by law, and, where that is impossible, the regulation of child labor in factories, shops, and industrial occupations.

(9) Careful and strict supervision by legal authorities and social endeavor bodies of children exposed to dangers by alcoholism of their parents, and also of the children endangered sexually.

(10) Transfer of sickly and diseased children to special sanatoria and hospitals. (Tuberculosis sanatoria for children, and other children's hospitals.)

Perhaps, and even probably, you have expected new things from me and you have been disappointed, as all that I have told you was known to you before this. But I must console you with the fact that useful, necessary, and beneficent things may be repeated frequently, but can never be told too often. Let us take it from the best side: "Prodest repetitio, semper aliquid hæret!" Let us stick to it. All that we do for our children is work for the great Cosmos; for, in our children, we preserve the race and the living world!

ST. MARGARET'S HOUSE, ALBANY, AN INSTITUTION FOR THE CARE OF BABIES AND THE TRAINING OF NURSERY MAIDS.

Dr. Henry Larned Keith Shaw, Union University, Albany, N. Y.

The care of institution babies presents many serious problems. Last year, in New York City, 42 per cent of all the deaths under 1 year of age occurred in institutions. There are 13 institutions and hospitals in New York State devoted exclusively to the care of young infants. These are all inspected by the State Board of Charities,

who require reports of admissions and deaths. There were 3,394 infants admitted to these institutions in 1902, and, in the year 1910 there were 5,619 admissions. The deaths, in 1902, numbered 1,148, a mortality of 34 per cent, while in 1910 there were 2,183 deaths, a mortality of 38 per cent. This tremendous death rate, which is apparently on the increase, calls for careful consideration of the conditions existing and the methods employed in these institutions. It cost $53,000 to maintain these 13 institutions in 1902, and $90,000, in 1910. The increase of $37,000 is in about the same ratio as the number of babies admitted.

The purpose of this paper is to describe one of these institutions, located in Albany, N. Y., a city of about 100,000 inhabitants. St. Margaret's House and Hospital for Infants started in a very modest way, in caring for one small baby, in 1883. This baby died after a few months, but was the seed from which the present structure has arisen. The sympathy of a number of charitable people was aroused, and a building was secured and remodeled for the care of young infants. For some years the work was affiliated with and under the same management as the Child's Hospital. The present building was completed in 1896, and was specially constructed for the care of infants, and is well adapted for that purpose. There are 11 small wards, with a capacity of from 2 to 8 cribs, and 2 private rooms, which are furnished and equipped as model nurseries. The capacity is 60 cribs, although it frequently happens that 70 or more babies are in the house at the same time.

Age is the only limitation to admission, and any infant under 12 months of age, who may be in need of careful nursing and diet, is received. They can remain until they are 2 years old, if their condition requires special care. Foundlings, illegitimate, and deserted infants are admitted on an order from the commissioner of charities. A study of the 2,326 infants which have been received since the institution was established shows that only 2 per cent were foundlings, but that the number of illegitimate babies outnumbered the legitimate by more than two to one. There has been a marked increase in the past 10 years of sick babies sent by their parents for active medical treatment.

Lack of air space and insufficient ventilation are the greatest faults in many similar institutions. The air space per infant in some of the wards is not over 500 cubic feet, still the ventilation is perfect. This is accomplished simply by the use of cheesecloth in the place of glass in the upper sashes of all the windows. A constant current of fresh air is thus secured, which renders a large amount of air space for each child less imperative. A satisfactory method of ventilation is thus secured at practically no cost and without any danger of drafts. The air is sweet and clean, and there is a noticeable absence

of objectionable odors. The babies' napkins are always changed in an adjoining room reserved for this purpose, and are never removed in the wards.

The most valuable part of the equipment are three piazzas which are screened in the summer and protected by glass in the winter. These piazzas will each hold 20 cribs very comfortably. An outdoor ward was constructed a year ago, and now all the babies can spend the entire day practically out of doors without any exposure. This permits the wards to be thoroughly aired during the day. In hot weather, all the cribs are kept on the piazzas day and night.

The general supervision of the work is in charge of a nonsectarian women's board of managers. This board is divided into small committees having special duties and responsibilities. There is a small endowment fund, but the financial support comes mostly from voluntary subscriptions and the board of the babies. The average cost of maintenance is $12,000 a year. The immediate direction is in the hands of a superintendent appointed by the managers. The medical staff consists of a consulting board and a nonresident physician in charge, whose services are gratuitous. A careful physical examination is made when each baby is admitted, and a daily feeding and stool chart and a weight chart are kept for each baby.

The main and most important problem to be solved in the care of babies, whether they be sick or well, is that of diet. The preparation and preservation of the food, therefore, receives most careful attention. The milk is obtained from a certified milk dairy and is studiously adapted to meet the individual needs, powers of digestion, and assimilation of each infant. This milk is neither pasteurized nor sterilized. Whenever possible, a wet nurse is employed to give breast milk for one or more feedings in selected cases. This should be done in every similar institution, for it has been the means of saving many lives. The diet kitchen, where the bottles are prepared, has tiled floors and walls, and the most rigid cleanliness is enforced, and the nursery maids are required to wear clean, white gowns. The refrigerators occupy an adjacent room specially constructed for the purpose of cooling bottles, and a temperature of from 45° to 50° F. is maintained.

One of our most distinguished pediatricians, after a visit to St. Margaret's, wrote the following letter to one of the managers. It may be permissible to quote freely from this letter, for, in the words of Solomon: "Let another man praise thee, and not thine own mouth; a stranger, and not thine own lips."—Proverbs, xxvii, 2.

My visit to your St. Margaret's House is among my dearest and most impressive recollections. Of more than 50 babies and very young infants, reared on artificial foods, with the exception of those whose deaths had nothing to do

with their feeding and were unavoidable from birth, not one died in more than six months; indeed, not one was ever sick. It did me good to see so many little ones smiling at the strange visitor, and I envied your city for having accomplished what is generally considered impossible. For it is a fact that it is extremely difficult to raise the children of the poor on artificial food, and particularly in public institutions. Painstaking care in housing, nursing, preparing the food, and establishing regular habits has performed wonders. Your contributors must feel amply paid for their goodwill and generosity by making an occasional call on the little ones whose lives they save and whose health they preserve, and by the example they give and the practical instruction they furnish both to the community and the medical profession. Such a result is a wondrous gratification to beneficent people, not to speak of the blessing conferred upon the community at large, by averting invalidism and by raising healthy and able men and women. It is the first few years of life that are the making of the adult.

A study of the admissions and mortality from 1885 to 1900 shows that the mortality ranged from 26 to 51 per cent, with an average of 38 per cent. During this period the mothers were permitted to live in the institution and to nurse their babies. They helped in the care of the house and in looking after other babies. From 1900 to 1912 the mortality ranged from 10 to 25 per cent, with an average of 16 per cent. This lessened mortality has been coincident with the establishment of a training school for nursery maids and a closer individual study of the digestive capabilities of each baby. These figures are a most convincing proof of the need of trained care in reducing infant mortality.

St. Margaret's does a great deal of educational work. It affords an opportunity for the students of the Albany Medical College to observe the methods and results of infant care and feeding and gives them an intimate knowledge of the commoner ailments of infants. Small sections of students are given instruction in the wards twice a week during the college year. A large number of visitors go through the building yearly, and the model nurseries and diet kitchen are seen by many mothers and illustrate how such rooms should be furnished. Not infrequently mothers are instructed in the proper methods of preparing food and of bathing the baby. Student nurses from other hospitals in the city visit St. Margaret's each year, where the workings and methods are explained in detail.

Perhaps the most important educational work is in the training of nursery maids. A training school for nursery maids is distinctively and peculiarly an American idea. The Babies' Hospital of New York was the first to provide this special training, and Dr. L. Emmett Holt is entitled to the credit of establishing the first training school. The demand for such training is shown by the fact that there are now over 20 similar training schools established in this country, besides several in Europe. The training school at St. Margaret's was

modeled after the one in New York and was started in 1900. The report of the board of managers for that year states:

A training school for nursery maids has been added this year, which secures, in the first place, better doing of the work, and, in the next place, will before long provide, from year to year, a well-trained company of young women, ready to go from it, trained and tested for the difficult and important duty of caring for little babies in their homes.

The following, taken from the information circular, which is sent out to the applicants for admission, will show the qualifications required and the duties demanded:

Applicants are received any time during the year when there is a vacancy, and a personal interview is always necessary when it is possible. They must be between 20 and 30 years of age, have a common-school education, furnish two references, written by employers, as to character, and be perfectly healthy. If, after having been accepted as a member of the training school, a pupil's health is not what it was represented to be, she will be asked to withdraw before finishing the course. No married woman or widow received. The course of instruction covers a period of eight months. (Six months in the hospital and two months at service under its supervision.) After having passed a satisfactory probationary term, which is from two to six weeks, and having been accepted as members of the training school, pupils then wear the hospital uniform, which they purchase at their own expense. The superintendent has full power to decide as to their fitness for the work and the propriety of retaining or dismissing them. She can also, with the approval of the committee, discharge them at any time in case of misconduct or inefficiency. Probationers do not wear the hospital uniform, but should come provided with two wash dresses and at least six white aprons. Pupils are boarded and lodged at the expense of the hospital and receive $5 a month. At the end of eight months, if a satisfactory examination is passed, they receive a certificate and places are found for them at service in private families at $25 a month.

Hours of duty: Day duty, from 7 a. m. to 7 p. m.; night duty, 7 p. m. to 7 a. m., each nurse in turn serving two months on night duty. Nurses also serve two weeks each in the diet kitchen. If the service permits, each nurse is excused from duty one afternoon every week after 2.20 o'clock; they are also allowed a portion of every Sunday. Nurses are not allowed to be out later than 9.30 p. m. or to go out evenings without the permission of the superintendent of the training school.

The applicant has also to answer the following questions:

1. Name in full and present address.
2. Are you single or a widow?
3. Age last birthday, date and place of birth.
4. Are you strong and healthy? And have you always been so?
5. Are your sight and hearing perfect?
6. Have you any disease of the lungs or any uterine trouble of any kind?
7. Have you any physical defects?
8. Have you read and do you clearly understand these regulations?

The demand for these nursery maids far exceeds the supply, and there is always a waiting list of ladies who desire these maids. The pupils are from the upper servant class and have this ranking in the

household. On the satisfactory completion of six months in St. Margaret's, they are sent to private families, and if they perform satisfactory service are given a diploma at the end of the eighth month. The salary for the first year is $25 a month, and the hospital will not permit the giving of a larger amount. The following information circular is sent to the employer of each nursery maid, so that there will be no misunderstanding as to the duties and privileges of the nurse:

The nurses must wear the complete blue uniform in the house at all times.

They take entire charge of an infant, or one small child, night and day, washing napkins and small flannel pieces, but they do not do their own nor any other laundry work.

They take care of the nursery and own room, and do the mending in so far as they are able.

Time off duty: One afternoon and evening every other week, intervening Sunday evening, and time on Sunday to attend one church service.

They are competent to meet any simple nursery emergency, but are not allowed to give medicine or in any way to prescribe for a baby without a physician's orders.

For the first year after graduation they receive $25 per month, $30 for more than one child.

The nurses are to be called by their Christian names, and are to be treated as the other maids in the house; they are also expected to use the back door.

It is customary to send railroad fare for graduates who go out of town.

Although not obligatory, it is the custom for any one securing a nurse from St. Margaret's to send $5 in appreciation of the service.

In case the nurse is not desired, this money is not refunded without a week's notice.

The advantage to St. Margaret's of this training school has been very great. It trains an adequate number of nurses who take great interest and pride in their work. It permits more personal attention and provides one nurse for each four babies. These nurses become very fond of their little charges, and the babies receive a certain amount of "mothering" that is excellent for them. The babies need a certain amount of affection and care which is best expressed by the term "mothering," and this should be encouraged. The course of instruction is as follows:

1. Infant feeding: The care of milk; milk sterilization; care of bottles; preparation of food, with rules as to quantity and frequency.
2. Bathing: Daily bath; the use of hot, cold, bran, and mustard baths.
3. Hygiene of skin, care of mouth, eyes, ears, and nose.
4. Nursery hygiene: Ventilation, temperature, cleanliness, care of napkins, etc.
5. Training of children in proper bodily habits.
6. Miscellaneous: Use of clinical thermometer, making of poultices, giving of enemata, gavage feeding.
7. Simple means of treatment in nursery emergencies.
8. The rudiments of kindergarten work.

The recitations and demonstrations are given by the superintendent, who uses the little handbook of Dr. Holt's on "The care and feeding of infants" as a textbook.

St. Margaret's House illustrates what can be done in a modest but effectual way to reduce the mortality in infant institutions. There are a large number of babies in every community who require hospital or institutional care. These babies thrive much better and are more intelligently cared for in separate and distinct institutions. The babies' ward in a general hospital or in a children's hospital is not so productive of good results.

DISCUSSION.

By Dr. HASTINGS H. HART: The statistics presented by Dr. Shaw exhibit the distressing fact that, while there has been a remarkable diminution of infant mortality in the general population, the institutions for infants have not shared in this reduction, but show an actual increase, notwithstanding the fact that they have medical staff and trained caretakers.

An excellent baby-saving show was held in Albany in November, 1910.

L. T. ROYSTER, M. D., Norfolk, Va.: One of the greatest causes of mortality in baby institutions is the fact that there are too few nurses and attendants for the number of babies. Most institutions have 1 nurse for 10 babies. Five is as many as they can attend to properly Increase the number of nurses and attendants and the mortality will come down.

Dr. HENRY L. K. SHAW, Albany: The milk in St. Margaret's is not pasteurized because we know the source of the milk, and are confident of its cleanliness. Pasteurization is therefore unnecessary. Several years ago we pasteurized the milk of one-half of the babies, and became convinced that, on the average, the babies fed on raw milk thrived better than those fed on heated milk.

THE FOUNDLING.

HOMER FOLKS, Secretary, New York State Charities Aid Association, New York City.

The prime necessity, in any consideration of the subject of foundlings, is to bear clearly in mind that there are real foundlings, and that there are so-called foundlings, who are not actually foundlings at all. The foundling is a child who has been actually abandoned in a street, hallway, park, field, or other public place, of whose parent-

age nothing is, or is likely to be, known, and as to whose parents there is, therefore, no opportunity either for friendly conference or for legal proceedings. The pseudo-foundling, on the other hand, is a child who is taken by his parents or relatives to a so-called charitable institution, sometimes miscalled a foundling asylum or foundling hospital, and turned over permanently to that institution, ordinarily under pledge of secrecy, with the understanding that it can not be reclaimed, and that its whereabouts will not be known to the parent. There is a vital difference between these two events. The real foundling is thrust upon us; the so-called foundling we achieve by our voluntary action. For the real foundling our responsibility as a community and as charitable agencies is, at most, indirect and remote. For the so-called foundling our responsibility is direct, complete, and unescapable. We take him from his parents with our eyes wide open, deliberately, and with full knowledge of what we are doing.

The number of actual foundlings is, as compared with the number of so-called foundlings, a negligible quantity. The number of actual foundlings in a few of the larger cities of this country, in 1911, as reported by the police departments, is as follows: New York, 138; Chicago, 38; Boston, 5; Baltimore, 8; Buffalo, 6; Washington, 5.

It is not my purpose to discuss at length the methods of caring for real foundlings. The subject is comparatively unimportant. The methods have been clearly worked out, and conclusions may be stated somewhat dogmatically without fear of successful contradiction. Real foundlings are not, in the great majority of cases, in a moribund condition when found. The great majority of them are not seriously diseased, nor seriously lacking in vitality. If kept at a central reception station only long enough for careful examination; if those suited therefor are immediately thereafter placed with a wet nurse, and those requiring hospital care placed under suitable conditions for receiving the individual care and treatment needed, the death rate among children who have passed through the ordeal of abandonment and exposure may nevertheless be brought down to approximately the death rate among other infants in the same locality. This has been conclusively demonstrated, in New York City, by a joint committee of the New York Association for Improving the Condition of the Poor and the State Charities Aid Association, which received and cared for one-half of the foundlings, taking them alternately, received over a period of years.

As stated above, however, the important aspect of this subject is not the real foundling, but the so-called foundling, who is not a foundling at all. If the number of real foundlings is almost negligible, the number of so-called foundlings is so large as to challenge our most serious consideration. For instance, in the city of New

York, where the number of actual foundlings last year was 138, the number of so-called foundlings was about 2,500, of whom about 2,000 were received in one institution; that is to say, for every one real foundling there are about 20 so-called foundlings.

Among these so-called foundlings the death rate remains high. All sorts of annual death rates can be prepared, but the inescapable and melancholy fact is that for a long series of years the number of deaths each year equals almost exactly one-half of the number of admissions. Put in another way, of the enormous number of children received, ranging in one institution from 2,000 to 2,500 per year, almost exactly one-half survive infancy, and almost exactly one-half find their way to the city morgue. This proportion is, of course, far in excess of the ordinary death rate among children of like age, and the mortality among this class of children alone constitutes a serious part of the total problem of infant mortality in our city, approximating 10 per cent of the total infant mortality.

It is not my purpose to discuss the ways and means by which the mortality among these infants, thus surrendered, might be reduced by more efficient methods of selecting wet nurses, of medical supervision, of more efficient hospital care for those becoming ill, and so forth. All that is apart from the underlying question which should be solved first. Is it necessary to have any such number of so-called foundlings? Let me state my opinion as briefly as possible: It is not only wholly unnecessary; it is wholly indefensible and shockingly wicked. The real and the only remedy for the situation is not to provide better care for the so-called foundling, but not to receive him into our care at all. Leave him with his mother; assist the mother, if need be, and you will thereby, in the great majority of cases, substitute breast feeding and individual home care for artificial feeding, or wet nursing after a period of artificial feeding, and you will at one sweep enormously reduce infant mortality.

The justification ordinarily advanced for the ready reception of infants from their mothers in the so-called foundling hospitals is that the babies are presumably born out of wedlock, and that if they were not received from their mothers or relatives in this manner, they would be actually abandoned by their mothers and relatives, and become real foundlings. For this assumption there is not the slightest shred of evidence. On the contrary, the facts stated at the outset of this paper, showing the number of actual foundlings in different cities in this country, controvert the assumption in the strongest possible manner. They lead to the same conclusion as figures which I collected some 20 years ago, when it was proposed to establish a so-called foundling hospital in one of our large cities, which at that time had no such institution. So far as the evidence goes, it would seem to indicate that, in those cities in which infants

are most freely received from their parents, and in the largest numbers, there, also, the largest number of other infants are actually abandoned upon the streets and other places. The cities which have very large numbers of so-called foundlings have also a relatively large number of actual foundlings. The assumed underlying justification for the foundling hospital absolutely disappears on close examination.

It is, furthermore, claimed that if the so-called foundling hospitals did not receive large numbers of supposedly illegitimate infants under pledge of secrecy, the horrible practices of infanticide and abortion would be increased. So far as I am aware, it is impossible to adduce any evidence having any conclusive and direct bearing upon this subject. No one with any knowledge of the facts would claim for a moment that the existence of foundling asylums receiving children readily has eliminated, or nearly eliminated, the practices referred to. I have heard of but one city in which collusion between the authorities and the abortionists became a matter of public discussion and a political scandal; that happened to be the city in which the doors of the foundling hospital are open very, very wide. It is my best judgment that, whether or not there be a foundling hospital has very little, if anything, to do with the prevalence or absence of abortion and infanticide. In any event, it can not be too strongly said that no evidence has been or can be adduced, except bold assertion, in justification of a so-called foundling hospital as a means of preventing abortion, infanticide, or abandonment of infants. On the other hand, the lamentable fact stands out everywhere that among the so-called foundlings the death rate is abnormally high. It is hard to overemphasize the responsibility resting upon those who stand for this policy.

As a result of some thought on the subject, I have reached a definite conclusion as to the remedy. The abandonment of a child by its mother at the doors of the so-called foundling hospital is not, in its essential aspect, very different from its abandonment in a railway station or street. In either case the child is likely to receive care and attention; in neither case will it be its mother's care. Now, the abandonment of a child by its mother in a railway station or a street, or any such public place, is a crime. Its abandonment at the door of a foundling hospital, in my judgment, is equally in ethics a crime, and should be made such by statute. It is a matter of public concern. Granted that there are exceptional cases in which a mother may be unable, for physical reasons, or for reasons of moral unfitness, to care for her child, this determination should be made only by duly authorized representatives of the people, and it should never turn on the bare question of whether or not the child is born out of wedlock. Of the 2,000 to 2,500 infants given

over each year by their mothers to the so-called foundling asylums in the city of New York there is, in my opinion, no conceivable doubt that 90 per cent or thereabouts should, under no circumstances, have been separated from their mothers. Only by preventing such separation, by force of law, if need be, can we deal intelligently and successfully with the problem of the so-called foundling.

DISCUSSION OF THE BABY-SAVING SHOW HELD IN PHILADELPHIA IN MAY, 1912.

Dr. SAMUEL MCC. HAMILL, Professor of Pediatrics, Philadelphia Polyclinic, Philadelphia, Pa.

Mr. Homer Folks, in opening the sessions of a conference on infant hygiene which was held in Philadelphia in connection with our baby-saving show, so aptly expressed our reasons for the selection of the title "Baby-saving show" that I shall take the liberty of quoting his remarks. He said:

> I was highly pleased to see that you gave yourselves the title, "Baby-saving show," which the New York Evening Post has referred to as "undignified, but very happy." All my experience indicates that there is a great difference between infants and babies. We usually talk about infants and infant mortality. I think you are very much wiser in talking about babies and in giving the babies a show. The difference between infants and babies is the difference between the vernacular and the academic, between the interesting and the uninteresting. There are exceptional men who would perhaps risk their lives to save an infant, but there is no man who would not instantly risk his life to save a baby. It seems natural that some dignified infants should die, pity though it be, but the death of a baby is always tragic, and always enlists our sympathy to the utmost degree. I was glad to be invited to a show, not an exposition, nor an exhibition, nor any other learned affair. People like to go to a show, but must be wheedled into going to an exhibition. I was also glad that the babies were not to be conserved or protected, but just merely saved—the good old short word. Everybody understands what saving babies is—I am perfectly sure that the appeal for saving babies would be irresistible and that a municipal organization to save babies could always get adequate support.

So much for the title.

Why was such a show held? Because babies need to be saved. The enormous death rate of the first year of life has been recognized for many years. The causes, the cure, and the prevention of the diseases which produce it have been studied exhaustively, and we have learned therefrom that by means of curative measures alone but little impression can be made upon the high mortality of infancy.

It has been a gradual evolution that has separated us from the medieval idea that all diseases could be cured by drugs and potions,

provided such remedies were administered by someone of supernatural ability. As we learned, more or less empirically, to recognize the limitations of drugs and to better understand the power of the human body to defend itself against disease, we were stimulated to study more carefully the composition of drugs and their action upon the functions of the body. This has resulted in the elimination of most of those which are devoid of therapeutic value, so that to-day the drug treatment of disease is limited largely to the application of drugs of known physiological action for the relief of disturbances of function in which such physiological action is definitely indicated.

It was but a short and natural step from a recognition of the limitation of drugs in the treatment of disease to a consideration of its prevention. In order to prevent disease, it was necessary to know its causes. The study of the causation of disease—world-wide and extending through many years—has furnished one of the most interesting chapters in medicine. It first took into consideration the relationship of diseased conditions to the events that had immediately preceded them. It proved an easy matter to establish an association between various factors and the subsequent disease, such, for instance, as the exposure to cold and the subsequent pneumonia. In the clinical study of cases the history of such exposure was exceedingly common, and aside from this pneumonia was more prevalent during the season of the year in which such exposure was possible. But this did not explain the processes which took place in the victims of pneumonia which caused them to succumb to an exposure which had no detrimental influence upon other individuals. Manifestly there was something lacking in this theory of the causation of pneumonia.

What was true of pneumonia was true also of many other conditions. Additional information was necessary, and the search for it was continued. All departments of medicine have been occupied to this end, but it has been chiefly through laboratory investigations that we have accumulated the information that has given us some foundation for the establishment of preventive measures.

The discovery of the germ origin of disease was the first great stimulus. This determined not only that in certain diseases there is a definite factor responsible for their production, but it opened up an entirely new field for investigation. It was not sufficient to know the bare fact that germs produced disease, but also the origin of such organisms, their viability outside of the body, the media in which they lived and grew, the avenues through which they were conveyed to their victims, their action upon the human body, and the way in which man protected himself against them, or, if infected, by what processes the infection was overcome, and, finally, what therapeutic measures could be evolved to protect against or cure such infections.

The study of the cause of disease, however, has not been limited to the work of the biologist. There are many diseases that are not due to microorganisms. Much new and valuable knowledge which has a very direct bearing upon the cause of disease has been contributed in the past several years by the physiological and chemical studies of the functions of the various organs of the body.

Out of all of these investigations in the field of biology, chemistry, and physiology we have accumulated a fund of knowledge which has been of inestimable value in our unending struggle against disease. All of our modern sanitary procedure is based upon the results of such work. For many years we have recognized an element of danger in filth conditions, in overcrowding, in defective ventilation, in vermin, in insects, especially the biting kind, but it was not until modern research pointed out to us the effect of overcrowding and bad ventilation upon the individual's resistance to disease, the relationship of filth conditions to the breeding of insects, the existence in vermin and insects of the diseases which attack mankind, and the ability of these creatures to transmit them to men, that we understood their true relationship to disease.

This recently acquired knowledge has enabled us to see that much of the disease to which mankind is subject can be prevented by the establishment of proper preventive measures. No more striking illustration of the truth of this statement can be given than the results of the noble efforts of the officers of the United States Government in the Panama Canal Zone. A comparatively few years ago, but before the discoveries of modern medicine, an attempt was made to construct a canal across the Isthmus of Panama. The project was eventually abandoned, mainly on account of inability to cope with the environmental conditions, which caused such widespread disease and death among the laborers that were employed in the work of construction. The United States Government entered this same district—one of the most unhealthful in the known world a few years ago—armed with a knowledge of the origin of the diseases which infested it and the methods of combating them. Under absolute military control, not only has the work of this vast project been almost completed but this formerly impossible district has been transformed into one of the most healthful regions of the world. What has been done in Panama and elsewhere under military law is possible of repetition in any part of the world. Unfortunately for mankind military control can not be universally adopted, and instead of demanding the cooperation of the inhabitants of the countries and cities of the world this must be secured by other means.

If the knowledge possessed by those who are educated in medicine and sanitation, as, for instance, the members of this great congress, was shared by all mankind, the health problems that confront the

governments of the world would be immeasurably simplified; but such knowledge, unfortunately, is restricted to a relatively small group, and it is this very ignorance that not only stands in the way of rapid progress in the control of disease and its mortality, but actually causes the great bulk of it.

There is no age period in which the number of deaths is greater than during the first year of life and none in which the number of preventable deaths is so great. It is also true that this high mortality is chiefly amongst those who are most ignorant. It is very manifest, therefore, that if much impression is to be made upon the mortality as well as the morbidity of this first year of life some means must be adopted by which this class of people can be taught to understand the danger of their environment and of their present methods of living, as well as to appreciate the value of the preventive measures which intelligent health officers are endeavoring to enforce.

How is such education to be administered? Ignorance of and indifference toward health measures are as old as man. To overcome this long-standing ignorance and prejudice in the shortest possible time is no sinecure. Large and widely different groups of people must be taught, and the lessons must be presented in such form as to interest and appeal to the intelligence of them all. The ignorant foreigner, who may not even understand our language or be able to read his own, must be enlightened. The children of the foreign born, who acquire the English language and adopt the American ideas more quickly than their parents, must be used not only as interpreters but also as teachers. They must be taught that they may teach. This is also true of the children of the native born, for in many of the families of the poor the older children are the acting mothers, the ones upon whom falls the responsibility of caring for the babies of the household.

Education must not be limited to the mothers and sisters of the family, however. The fathers must be made to understand what is needed for the safeguarding of their babies' lives. This phase of educational work has been entirely neglected or left to be imparted at second hand by wives and children. Without this knowledge, the cooperation of the head of the household, which is absolutely essential, will be lost, and much of the effort expended in teaching the wives and children will go for naught.

Education must extend also to the more enlightened element of the community. While it is true that relatively few of the infant deaths occur among this latter class, it must be remembered that even here there is a very unnecessary waste. This must be prevented, and, at the same time, the educated classes must be made to realize the enormity of the infant death rate among the poor, the conditions

which cause it, and the possibility of its control—yes, even more, they must be made to earnestly cooperate in the struggle to end this unnecessary slaughter of the innocents.

The ignorance of many of the educated, if one may use a paradox, and their attitude toward the problem of baby saving, is incomprehensible. Whilst making personal appeals for funds to finance this Baby Saving Show, one of the most cultivated men of my acquaintance seriously argued with me that the present-day city must be looked upon as a place for children to die in—as little better than a morgue. This is only one of several viewpoints that were equally remarkable. The minds of such men must be cleared. They must be brought face to face with the living problem; they must see things as they are, so that they may understand why they should not be.

What are we doing to educate these widely divergent groups of people? How, for instance, are we telling the educated and comfortably situated in life how the other half lives, of the morbidity and mortality of their children, of the causes that produce these results, and the possibility of their prevention? Occasional items appear in the public press, occasional articles are published in weekly or monthly magazines, occasional lectures are delivered, and occasionally health boards issue health pamphlets. Doubtless these documents are read by some, remembered for a time, and then forgotten. I question very much whether the newspaper and magazine articles as much as compensate for the baneful influences of the beautifully illustrated and richly promising patent food and drug advertisements which these same publications contain. Only a small minority can be reached in this way. The problem of educating the educated is still far from being solved.

Federal, State, and municipal governments are studying the problem of baby saving; charitable institutions and organizations are adding their efforts; and great international congresses are being held in the interest of the lives of the babies. The educated public knows that something is going on—perhaps that the lives of babies are under consideration—but they do not get from such activities an intimate knowledge of the facts which they must know before we can hope to have their active cooperation in working out this great problem of baby saving.

For the other class—the ignorant poor—much more direct work is being done. Printed instructions upon the care of the baby and on general matters of hygiene, easy of comprehension, and in the necessary languages, are being distributed. What is of more importance, municipalities are establishing departments of child hygiene, which have their milk stations and various other educational centers, and their corps of social workers and visiting nurses who carry the desired knowledge directly into the home. Social organizations are estab-

lishing educational settlements in the densely populated and poverty-stricken districts of our cities, and conducting many other activities, the purpose of which is to establish right methods of living.

Relatively recently, educational exhibits have come into vogue, and our limited experience of them has clearly shown that they must be reckoned among, if not considered, the most efficient means at our disposal for the dissemination of knowledge and the stimulation of public opinion. The very remarkable international tuberculosis exhibition held in this city (Washington) a few years ago, and that most wonderful health exhibition in Dresden last year, carried knowledge of the causes, ravages, and methods of prevention of the great white plague and all other preventable diseases to hundreds of thousands of individuals who would not have obtained such information in years through the avenues previously described.

Such exhibitions convey knowledge through the medium of both the eye and the ear, and as Prof. Adami has well said:

> It is a principle absolutely established in teaching that facts, when reaching the brain through the one channel of either hearing or seeing a written page, do not impress the mind or become fixed therein with the same sureness as when both ear and eye are employed, or when not the written statement or description, but the facts themselves, are actually brought within the experience of the observer, or when, in place of abstract figures, descriptive pictures or illustrative diagrams are employed. The graphic representation of a condition is very much more impressive than any amount of reading or study of columns of figures.

It was because of our belief in this method of impressing the minds of communities that we organized a baby-saving show in Philadelphia. As you will observe from its title, it was not a child-welfare exhibit, but merely a baby-saving show. We restricted our efforts to this particular period of life because we wished to impress upon the minds of the Philadelphia public the enormous mortality at this age period and the possibility of its prevention, and we chose the month of May, as it immediately preceded the time of the year in which the preventable infant deaths are most common.

It is manifestly impossible to give a detailed description of this extensive exhibition in the limits of a short paper. I shall, therefore, consider a few of those features which seemed to us to be of special interest.

DURATION OF SHOW.

It was determined to hold the show for a period of nine days in the central portion of the city, and, later, for periods of four days in each of four of the thickly populated portions of the city. The subsidiary shows were given for the benefit of those who could not afford the time nor the money to go to the central portion of the city. These

subsidiary shows were probably a mistake. The exhibits could not be moved in their entirety; they had to be quickly transported and quickly put into place; the exhibition rooms were inadequate; the arrangement of the exhibits was less attractive and less effective; the conduct of the exhibit was more difficult; intelligent demonstration was lacking; and, judging from the size and character of the attendance upon the main show, it is probable that a larger group of people could have been reached and more good accomplished had the show been continued for another week in the central location.

COST OF THE SHOW.

The total amount of money expended in the preparation, the conduct, the taking down and transporting of the exhibit, and the publication of an illustrated report will amount to $14,300, which, for a show of its magnitude, and in the light of the fact that it was transported to four widely separated points, seems a very remarkable showing.

METHOD OF FINANCING THE SHOW.

Practically this entire sum was underwritten by a group of public-spirited private citizens who guaranteed amounts varying from $100 to $200 before any public appeal for funds was made. An appropriation of $5,000 by the city government, together with the general subscriptions, will enable us to return to the guarantors about 40 per cent of their guarantees.

SELECTION OF EXHIBITION HALL.

For the housing of the initial exhibit we selected the most attractive centrally located exhibition hall in the city, because we believed there was much educational value in a setting that would provide adequate light, space, ventilation, and cleanliness, and make possible simplicity and beauty of arrangement of the exhibits.

COLOR SCHEME FOR CHARTS, PHOTOGRAPHS, AND BACKGROUNDS.

Before the preparation of the exhibit was begun we determined upon a uniform color scheme for the backgrounds and mountings of the charts and photographs as well as a uniform method of lettering which would be attractive and at the same time restful to the eye. The backgrounds were of a light sage green and the charts of an ivy green, and the lettering in white, of uniform size, and large enough to be read from a distance.

THE LEGENDS.

Realizing the discouraging effect of long legends and overfull descriptions we insisted upon short legends, clearly, concisely, and

directly expressed—the presentation of a small number of salient points expressed in the most emphatic way—rather than to risk fatiguing the visiting public by setting forth in charts everything known of the various activities employed in baby saving. We also eliminated intricate statistical charts as a feature of the show. For the benefit of those who desired to study them, we exhibited a few admirably prepared statistical charts secured from the Bureau of the Census, the United States Department of Commerce and Labor, the Department of Health of the State of Pennsylvania, and the Department of Vital Statistics of Philadelphia, practically all of which were graphically arranged.

OBJECT TEACHING.

Realizing also that concrete object lessons represent the most effective means of fixing facts in the minds of the people, we illustrated much of the exhibit by means of objects, some of the booths containing practically no legends.

PLAN OF EXHIBITION BUILDING.

The exhibition hall was divided as follows: On the first floor was the entrance hall to the main stairway, on either side of which there was admirable space for exhibition purposes, and in the rear of the building there was a large audience room, which was used for lectures and demonstrations. On the second floor there was, in the front of the building a large foyer, and leading from this on either side of the stairway, were wide corridors, with more than 200 linear feet of wall space, and back of these the main hall of the building.

PLACING AND CORRELATION OF EXHIBITS.

In the entrance hall to the right of the stairway was placed the admirable exhibit of the department of health of the State of Pennsylvania, and to the left the statistical exhibit of the United States Bureau of the Census. The corridors of the second floor accommodated the loan exhibits of the various charitable organizations of Philadelphia and other cities. In the main hall of the second floor was placed the main exhibition, which was created by the committee having the show in charge. It was in this hall that the relationship of the exhibits to each other and the order of their sequence were given the fullest consideration. The crowds that entered the hall were required to follow a one-way arrow, which compelled them to study the sections in the following sequence: First, heredity and eugenics; second, housing and environment; third, the care of the mother during pregnancy and the lying-in; fourth, the care of the newborn;

fifth, breast feeding; sixth, the relative value of milk and the proprietary foods; seventh, the production and handling of milk and the care of milk in the home; eighth, the substitute feeding of infants; and, ninth, the care of the baby, its clothing, bathing, exercise, hours of sleep, etc. In other words, each visitor to the show had impressed upon him, first of all, prenatal influences which affect the morbidity and mortality of infant life, influences concerning which the majority knew nothing. The lessons in this department were so directly taught, and the relationship of cause to effect so clearly defined, that no one of ordinary intelligence could possibly fail to read them.

From this division of the subject the visitor passed on to the consideration of the postnatal influences, of many of which he had heard, but concerning which he was here to learn more.

SEPARATION OF THE EXHIBITS OF PROPER AND IMPROPER METHODS.

There was one feature in the general arrangement which we found of great value, and that was the separation of the exhibits of incorrect and detrimental methods and equipment from those which were correct and helpful. We had found by experience in other exhibitions that where the good and the bad were placed side by side the illiterate classes had sometimes carried away and put into practice incorrect methods, assuming that anything which had been observed in the exhibition was worthy of imitation. The only studies in contrasts which were approved were those between good and bad dairy barns, illustrated by models, the right and wrong way of caring for milk in the home, and a good and bad living room. These latter were reproductions of a dirty, dilapidated room, which was transformed into a clean, attractive room by the expenditure of $2.87, plus a little muscular effort on the part of the occupants, and a stirring up by the visiting nurse of the landlord and the city authorities to the point of carrying out the sanitary measures which they were legally bound to effect.

BOOTH CONTAINING THINGS BAD FOR BABIES.

The undesirable things were shown in the foyer, which was in the front of the building and separated from the main hall by the corridors, and over the entrance of which hung the lengend, "Things which are bad for the baby." This arrangement, aside from preventing confusion, enabled us to broaden the scope of this phase of the exhibition. In this booth were shown rooms with defective ventilation, untidy, illy furnished, and overcrowded; baby pacifiers; improper feeding bottles and nipples; injurious secret nostrums and patent medicines; incorrect methods of bathing, holding, and feeding babies; the bad effects of strong lights upon the eyes, etc.

SECTION ON BREAST FEEDING.

Especial effort was made to lay stress upon the importance of breast feeding. The booth devoted to this subject was one of the most artistically and attractively arranged in the entire exhibit. It contained, amongst other things, some admirable photographs illustrating the proper method of holding the baby during nursing, an advergraph, an electrically operated instrument that displayed successively a series of valuable legends relating to breast feeding, and an exquisite color drawing of a mother nursing her baby. A perfect reproduction of this drawing, on the reverse side of which were printed proper instructions for breast feeding, was freely distributed from this booth by an attractive, intelligent nurse in uniform.

SECTION ON HEREDITARY SYPHILIS.

Another most successful section was the one relating to hereditary syphilis. This was the first exhibit approached upon entering the main hall. The first charts defined in delicately framed but unmistakable language the most common method of conveying syphilis. Beside this was a chart defining the Wasserman reaction in simple language, and, for the purpose of attracting the eye, in the center of this chart was placed a series of tubes illustrating the reaction. Beside this were charts pointing out the length of duration of syphilis, especially of inadequately treated syphilis, the certainty of its transmission to the offspring, and the importance of the blood test for those who had had syphilis, especially those who contemplated matrimony. The balance of the exhibit consisted of colored drawings of the lesions of congenital syphilis, each drawing bearing a descriptive legend.

A boldly illustrated public exhibit of syphilis was entirely new to the city of Philadelphia, and its effect upon the public mind was observed with very great interest by the committee. It was previously planned that this exhibit should be very carefully and at the same time clearly demonstrated, and that no misinterpretation of its purpose should be imparted to the mind of any of the youthful visitors to the exhibit. There was no part of the show that was studied more thoughtfully and apparently none that made a deeper impression.

As an illustration of this, one of a number of instances may be described. A young man was observed to approach the exhibit and carefully study it in every detail. He was apparently much impressed and agitated by its teachings. He immediately sought out a member of the committee, to whom he confessed that he had had syphilis, that he had been married within a year, and that his wife was pregnant; and he desired to know if there was anything which

he could do to protect his prospective offspring from the possibility of congenital syphilis. It is reasonable to assume that this lesson, which was probably learned too late by this young man, was impressed upon the minds of many of the thousands of young people who had the opportunity of studying it. Many illustrations of this character could be related in regard to every one of the exhibits.

DEMONSTRATORS.

Experience in other exhibitions held in Philadelphia had impressed upon the committee of the baby-saving show the importance of having enough demonstrators to explain the exhibits to everyone that entered the exhibition building. Consequently, permanent demonstrators were placed in practically every booth. These demonstrators were thoroughly conversant with the lessons the committee desired to have imparted. In addition to these special demonstrators, there was an adequate group of carefully selected demonstrating guides composed of young physicians and advanced medical students who were conversant with the general purposes of the exhibitions and who piloted individuals or groups of individuals throughout the entire exhibit. Besides these demonstrators there were always present in the building a number of members of the committee, who not only volunteered their services as demonstrators but to whom anyone desiring special information was referred.

There has probably been no exhibition in America in which the demonstration of the exhibits was more satisfactorily conducted, and none, therefore, we believe, in which the lessons intended to be taught were more clearly imparted.

NUMBER AND PERSONNEL OF THE VISITORS.

In the nine days in which the show was given in Horticultural Hall it was visited by 67,000 persons. Children of 12 years and younger were not admitted unless accompanied by their parents or guardians, and no children or youths were permitted to wander through the exhibit unattended. The personnel of the visitors, however, included a very large group of little mothers whose attention was especially centered upon the portions of the exhibit which bore most directly upon the care of the baby. Of the total number of visitors, the majority was unquestionably made up of prospective mothers and mothers with infants. One of the demonstrators in a booth devoted to the clothing of the baby was consulted by more than a thousand pregnant women, and during a single hour on one day 200 women with babies in their arms entered the hall. On this particular day there were admitted 1,200 mothers with babes in arms.

The number of fathers who came to get information for mothers who could not come was striking. Many of them came with pencil and paper to make notes of the things they wished to remember.

An interesting feature was the large attendance of the well to do and rich, and it was very gratifying to see many of these return a second and a third time, selecting hours during which the attendance was smallest, in order that they might study the exhibits thoroughly. The attraction of this class of individuals was one of the most important developments of the show, in that, in the sections bearing upon heredity, eugenics, and housing conditions, many of them gained their first knowledge of the dangers which surround the offspring of the poor and ignorant inhabitants of our cities—a very important lesson for them to have learned, since the support of this element of the public is very essential to the carrying out of public-health measures.

The show was very largely attended and carefully studied by active social workers and philanthropists, not only from Philadelphia, but also from other cities, thus extending its educational value beyond the confines of a single city.

As a supplement to the exhibition, and with a view to broadening the scope of our educational work, four short lectures were delivered in the lecture hall on the first floor of the building each day, two in the afternoon, and two in the evening. All of these lectures related directly or indirectly to the subject of baby saving, and they were delivered by men and women from various parts of the country who were especially conversant with the topics assigned them. Immediately before and immediately after each series of lectures, and again at midday, several educational moving pictures were shown. In no way was the desire of the public to learn better illustrated than in the attendance upon these lectures and demonstrations. The room, which had a seating capacity of nearly 300, was overtaxed at practically every session, and the audiences were always attentive and alert.

The lectures and demonstrations were continued during the course of the subsidiary shows, and were marked by the same characteristics.

During the week of the main exhibit, and with a view to interesting social workers and all others intelligently interested in the problem of baby saving, there was held a conference on infant hygiene, the contributions to which were made almost exclusively by especially chosen individuals from other cities. The transactions of this conference, which are to be published in the report of the show, illustrate its scope and value better than any description which I might give.

There are three additional points to which I wish to refer in closing: They are the babies' rest room, the character of the literature distributed, and the absence of a commercial exhibit.

Realizing that many babies would be brought to the show, we felt it incumbent upon us to make some provision for their care. For this purpose a room in the rear of the first floor, adjacent to a toilet, was equipped with cribs and all other necessary articles. The room was presided over by two trained nurses and a resident physician. Sanitary diapers were provided and absolute cleanliness was insisted upon. Mothers were taught the value of care and cleanliness, both by example and by word of mouth. Unfortunately the capacity of the room was overtaxed, but many valuable lessons were taught there, and the committee learned the importance of adequately providing for the care of babies during exhibits of this character.

As to the literature, but two official documents were distributed; one the colored drawing already referred to, and the other a booklet entitled "the care of the baby." This latter was a very carefully and attractively prepared document which contained all the information a mother would need for the proper safeguarding of the baby, expressed in simple, direct language. The distribution of many tracts and pamphlets was proscribed, because experience in other exhibitions had taught us that the essential lessons were often lost in a multiplicity of documents.

No one who has not experienced it can appreciate the relief that comes from the absence of a commercial exhibit. Commercial exhibits bring a revenue, but nothing else of value, and the revenues from rented space are offset a thousandfold by the noise and clatter, the barking of wares, the misleading statements, and the clouding of the mind of those who come to learn. Professional exhibitors are versed in the art of demonstrating; they know how to touch the sympathetic chord and are proficient in the art of promising more than they can give. They lure the crowd and center the attention upon what they have, and the real exhibition, which is of some value, gets no show. We recommend to all those who contemplate the formulation of exhibits the elimination of the commercial exhibitor.

It is a very difficult matter to measure the effect of exhibitions. It is reasonable to assume that a fair percentage of those who come to learn will carry some lessons away with them, and that, in many instances, they will either directly or indirectly impart them to others. In the light of these probabilities it would seem that the influence for good should be far-reaching.

It is too soon to know the effect of this Baby Saving Show, but a study of the infant mortality of the city for a comparison with that of other cities, and an inquiry amongst physicians, social workers, and visiting nurses is being made at the present time to see if any data can be secured which will justify the hope that we have done much for the saving of babies in the city of Philadelphia.

DISCUSSION.

Dr. P. M. Hall, of Minneapolis, Minn.: If I understand Dr. Woods's inquiry it was, Has any State passed a law requiring a mother to nurse her baby. Such a bill was proposed before the Minnesota State Legislature, but it failed of passage.

Dr. T. M. Koon, Grand Rapids, Mich.: We have a death rate of 10 per cent in Blodgett Children's Home at Grand Rapids, which we attribute largely to employment of wet nurses for infants.

We receive illegitimate babies and those with one or other parent dead. We feel that it is better for the home to take the illegitimate babies, and later adopt them into good homes, than to leave them with the mothers.

Dr. D. M. Totman, Syracuse, N. Y.: The nurses connected with the health department of the city of Syracuse made visits to 165 newborn babies whose births had been reported. Of these 72 per cent were cared for by physicians and 28 per cent by midwives.

The preventive treatment for ophthalmia was used in 98 per cent of the cases, and the eyes were in a healthy condition except in the 2 per cent in which this preventive was not used. Ninety-seven per cent were found to be breast fed. The nurses made several visits to each baby and assisted and educated the mother in bathing and caring for her baby. These visits were made during the months of July and August, and no deaths were reported among these babies during that time.

L'ÉCOLE DE L'AVENIR.

M. A. Augustin Rey, Architecte, Paris, France.

L'espoir d'une nation est dans la jeunesse du pays. Or celle-ci passe aujourd'hui tout entière par l'école. Ce stage obligatoire et nécessaire doit être, avant tout, profitable à la santé physique de l'enfant.

Primo vivere . . . et ensuite s'instruire.

L'école doit être une pépinière d'enfants sains et bien portants. C'est à ce prix seulement qu'on prépare des races fortes; c'est par l'hygiène bien comprise, et bien apprise à l'école, qu'on triomphera des terribles fléaux sociaux qui étreignent l'humanité et dont le plus cruel de tous est la tuberculose.

Selon le mot profond de Pasteur: "Pour sauver une race menacée par une maladie contagieuse, le mieux est de préserver la graine." Envisager ainsi la question de la tuberculose, c'est poser toute la question de l'hygiène scolaire.

La plante humaine a besoin avant tout de soleil et d'air. Pour grandir et se fortifier *l'enfant doit, à l'école même, être tenu*, pour

ainsi dire, *dans un bain continuel de lumière et d'air; il n'y a d'air pur que celui qui a passé sous les effluves des rayons du soleil.*

Le soleil luit pour tout le monde et il est d'une souveraine équité de faire bénéficier de ses bienfaits l'humanité entière.

On commence, enfin, à comprendre l'importance capitale, l'action toute puissante des rayons solaires sur la santé: on se rend compte du rôle primordial et multiple des manifestations lumineuses du soleil. *L'importance de l'action microbicide et purificatrice des rayons ultra-violets du spectre solaire est, à notre avis, la découverte fondamentale de l'hygiène moderne.*

La lumière et l'air sont les bases de la vie, les éléments sans l'abondance desquels il n'y a pas de santé pour l'être humain. Lorsqu'il s'agit de déterminer dans leurs moindres détails les programmes de construction des bâtiments scolaires, ces deux éléments doivent primer tous les autres.

On peut dire qu'une véritable révolution s'accomplit à cet égard, à l'heure actuelle, dans les habitudes d'existence des différents peuples.

Les grands principes fondamentaux de l'hygiène sociale sont aujourd'hui reconnus un peu partout. Ils forment le code international de l'hygiène moderne; les climats divers, les conditions sociales différentes d'existence ne peuvent qu'en modifier le détail.

La règle générale pour les pays civilisés reste toujours. Pa même a cet égard l'utilité des Congrès Internationaux ne saurait être assez reconnue. Ils permettent, à intervalles périodiques, à chaque nation de faire le résumé des progrès réalisés par les autres peuples et de rechercher les améliorations immédiatement applicables.

Il n'y a pas d'internationalisme plus utile à l'humanité et plus profitable à tous ses membres que celui qui se manifeste dans le domaine de Hygiène Sociale. Or, sur ce terrain, un grand mouvement se dessine déjà victorieusement pour faire profiter tous les êtres humains du droit à la vie, c'est-à-dire, du droit de l'existence dans les conditions naturelles primordiales de la santé: la pleine lumière et le plein air. Soustraire le moins possible l'organisme humain aux conditions naturelles de la vie à l'atmosphère extérieure, c'est là tout l'art de vivre longtemps conformément à la nature.

Les Congrès multiplient sans cesse les appels en faveur de cette grande cause de la santé publique. Les essais pratiques pour l'amélioration des notions de la vie, les efforts tentés en faveur de la vie en plein air notamment, restent encore trop timides. *Le mot d'ordre de cette nouvelle croisade; "Pour la lumière et pour l'air," n'est pas encore compris des gouvernements et des foules.*

Il est temps, il est grand temps, de se hâter de faire accomplir à l'humanité ce voyage sauveur de l'obscurité des villes où s'étend et s'accroît la vie de misère dûe au surpeuplement, à la vie normale en

pleine lumière et au grand air. A ce prix seulement est assurée la santé de la race.

Si l'on veut aller au fond des choses, et descendre aux causes premières de la faible natalité de certaines nations, on trouvera presque toujours à *cette racine du mal* social, la funeste condition de l'habitation insalubre et *l'habitude néfaste du citadin de vivre presque enfoui dans les plis obscurs de sa maison, loin des salutaires rayons du soleil.*

Or la santé d'une race est avant tout faite de la santé des ses enfants, les hommes, les citoyens de demain. L'enfant, avant son plein développement, est une plante fragile entre toutes, dont l'existence est exposée à tous les dangers de la contamination. L'art de protéger, de fortifier, d'accroître avec des forces en croissance continuelle, la santé de l'enfant est un des plus importants problèmes qui intéresse l'avenir et le bonheur des races, la tâche la plus pressante, le devoir le plus impérieux de la société.

Comment ne pas constater que ces petits cerveaux d'écoliers qu'on remplit trop souvent et trop prématurément d'un amas indigeste de connaissances hâtives, que ces petits corps atrophiés par une mauvaise hygiène seront des organismes tout préparés à n'opposer qu'une faible résistance aux influenecs morbides.

C'est donc la construction rationnelle des bâtiments scolaires et les méthodes nouvelles qu'il convient d'appliquer qui intéressent aujourd'hui au plus haut degré la santé publique.

Dans notre civilisation moderne ou toutes les jeunes générations doivent passer par les classes, l'école exerce une influence profonde sur le développement général de la race. Il faut donc que l'école soit comme une pépinière où la jeune plante se développe et se fortifie et non où elle l'atrophie.

Pour saisir ce que peut l'hygiène scolaire sur la santé générale d'une nation, il suffit de se reporter aux enquêtes décisives de ces dernière années. Les conséquences qu'ont, sur la vitalité d'un peuple civilsé, les conditions hygiéniques dans lesquelles est donnée l'instruction à l'enfant méritent de préoccuper et d'inquiéter l'opinion publique au plus haut point.

Le fait brutal qui domine la vie moderne dans les grands centres urbains est l'agglomération de la population; le surpeuplement va sans cesse croissant et constitue, de ce fait, un vice profond dans nos conditions d'existence.

Il ne faut pas craindre de condamner énergiquement l'insuffisance des emplacements destinés aux écoles.

L'école primaire, notamment, qui intéresse la grande majorité des enfants, et qui l'absorbe pendant ces années si précieuses où se fabrique, pour ansi dire, la santé future d'une nation doit être entourée, lors de sa création, de soins presque maternels.

Retenant l'enfant pendant cette période décisive de son développement physique, l'école devrait être toujours dégagée de toutes parts et éloignée, dans des proportions raisonnables, de tous autres bâtiments urbains, afin de voir le maximum de rayons solaires.

La racine de tout le mal qui existe dans les villes au point de vue de l'hygiène de leur population, c'est la spéculation honteuse, considérée, hélas! comme licite, dont le sol des villes est l'objet. *Cette spéculation est comme un grand crime social.*

La masse des citadins souffrent injustement, et sans le savoir souvent, des encouragements donnés par les institutions nationales et fiscales à la spéculation sur le sol des villes. Cette spéculation dans certains centres a atteint cette folie du terrain cher qui crée automatiquement la maison à étages et son agglomération invraisemblable. Elle constitue un monstrueux contre sens hygiénique et social.

Le bloc à étages se propage ainsi à l'infini avec le cortège obligatoire des cours obscures et nauséabondes, de deshonorent rues froides et sombres, qui de plus en plus la cité moderne.

La spéculation sur le terrain où s'élève et cherche à grandir la cité, voilà le chancre rongeur des grandes villes.

Si l'on ne veut pas attaquer résolument et de front ces pratiques spéculatives et chercher à appliquer les solutions qui conviennent à cette nécessité primordiale pour la collectivité du maintien du terrain urbain à bas prix, et des espaces libres qui en sont la conséquence immédiate, l'habitation saine du plus grand nombre, comme l'école salubre, deviendront des problèmes toujours plus ardus à résoudre.

Pour la population agglomérée dans les villes, qui représente dans chaque nation une proportion grandissante, il est établi par des statistiques que de mauvais bâtiments scolaires compromettent gravement la santé citadine et l'avenir de la race.

La construction de ces bâtiments a suivi, certes, d'incessantes améliorations. Certains pays ont accompli, dans ce domaine, des efforts incomparables. Sans vouloir méconnaître ceux qui ont été réalisés par de grandes villes étrangères, il est équitable, croyons-nous, dans un congrès international, de dire qu'à cet égard la ville de Paris a réalisé des progrès constants.

Mais il faut oser le dire, le programme de construction des écoles nécessite aujourd'hui de véritables transformations.

L'école doit avoir pour principal objectif, et pour premier devoir, avant tout, la santé de l'enfant.

Or qu'est-ce que l'école actuelle? Comment est-elle construite? Comment doit-on bâtir l'école de demain?

La construction de l'école doit être l'objet de grandes réformes si les administrations ne veulent pas sévèrement, mais justement, être rendues responsables de l'affaiblissement de la race.

Dès l'école, et surtout à l'école, les habitudes de vie antihygiéniques sont funestes. L'enfant des villes est laissé dans l'ignorance complète des phénomènes les plus élémentaires de la nature, et de l'action néfaste des transgressements à l'hygiène naturelle.

Cette méconnaissance déplorable de ce qu'est la mauvaise hygiène, l'oubli des lois de la nature, entraînent tout être humain, et surtout l'enfant, à des conséquences désastreuses.

Actuellement que sont les bâtiments d'école? Trop souvent de grandes casernes, à nombreux étages superposés où l'on entasse les uns sur les autres des régiments d'écoliers. On cherche à y placer le plus grand nombre possible de classes pour recevoir les élèves en nombre toujours croissant.

On rogne sur les emplacements qu'il faudrait laisser en espaces libres. On n'hésite pas à établir des préaux dans de simples cours fermées, sans communications avec de larges espaces extérieurs, et cela au hasard de terrains souvent de formes impropres au but. N'a-t-on pas vu, dans de grandes villes d'Europe, instituer des concours pour l'établissement de plans d'écoles sur de terrains aux formes les plus défectueuses! Les artifices de concurents rompus à toutes les difficultés n'arrivaient trop souvent qu'à mal les masquer. Ceci ne devrait pas avoir lieu; les plus beaux terrains municipaux devraient toujours être reservés à la construction des écoles.

Pour sauvegarder la santé des enfants à l'école, partie la plus essentielle de la santé publique, il faut, avant tout, avoir en vue d'assurer la pénétration des rayons solaires jusque dans les moindres recoins de l'édifice scolaire. *Faire entrer du ciel, le plus de ciel possible, à l'intérieur de l'école, voilà le devoir de l'Architecte.* Plus de dépenses inutiles en bâtiments énormes et en façades fastueuses faites pour le coup d'œil, pour la vanité, plus de frontispices orgueilleux, d'inscriptions flamboyantes!

L'Architecte doit résolument abandonner l'ornière de la routine où il s'est enlisé trop longtemps, ne voyant que l'aspect extérieur des choses. *Il doit se consacrer tout entier, avec le sentiment de sa haute responsabilité sociale, à l'appropriation parfaite du dedans.*

L'instrument de vie et de bonheur que doit être l'école moderne, pour le petit peuple d'enfants qui la fréquente, doit obliger aujourd'hui l'Architecte à de nouveaux et sérieux efforts.

Nous sommes encore, dans nos bâtiments, destinés au service essentiel de la vie de la cité les esclaves de vieilles formes surannées, de style, de proportions fictives, de moulurations et de décors sans signification et sans objet. Nous restons, surtout dans les centres urbains, les victimes quotidiennes d'habitudes irrationnelles d'existence. Les campagnes ont au moins l'air et l'espace si elles ne connaissent pas encore suffisamment l'hygiène de la propreté. Les petites villes, si elles ont gardé trop souvent leurs vieux quartiers aux ruelles quit n'auraient

pas besoin d'être obscures, et aux habitations qui n'auraient pas besoin d'être délabrées pour rester pittoresques, ces petites villes ont du moins la nature à leurs portes. Mais les grands centres urbains sont les victimes d'un état de choses lamentable au point de vue de l'hygiène.

On a été surpris, il faut le dire, par cette vice de l'homme vers les grands centres qui a crié ce facteur essentiel de la misère, le surpeuplement. L'accroissement du nombre des habitants des grandes villes a devancé, d'une façon énorme, et l'espace et les logements disponibles. Sans doute la périphérie s'est agrandie; les faubourgs et les communes des environs, les "suburbs," comme disent les anglais, se sont étendus prodigieusement. Mais les moyens de locomotion, l'accroissement rapide et l'agencement des transports faciles multipliés et à bas prix, n'a pas suivi le plus souvent une marche correspondante aux nécessités journalières des travailleurs.

La masse de la population par ses enfants a donc souffert matériellement, non seulement dans son confort, mais surtout dans sa santé. Les classes pauvres, logées dans des bâtiments surpeuplés, sont les victimes de déplorables conditions d'éclairage et d'aération. Il est triste d'avoir à constater que dans des pays qui se disent civilisés et qui, par plus d'un côté, retournent à la barbarie il y a une lutte de plus en plus grande à soutenir pour organiser rationnellement ce qui est essentiel aux besoins vitaux de l'être humain.

L'architecture scolaire doit aujourd'hui se pénétrer de formules nouvelles, elle doit obéir à cette grande loi de l'hygiène moderne, la lumière solaire et l'air pur repandu partout. C'est donc le devoir précis de l'Architecte de nos jours d'appliquer à son tour les progrès techniques qu'on attend de son artivité, de son zèle, de son devouement, au bien être social.

Tout d'abord, pour sauvegarder à l'école la santé de l'enfant, il y a lieu, dans l'avenir, de ne plus élever de bâtiments où la seule préoccupation dominante soit de produire d'imposants effets de façades.

L'Architecte scolaire ne doit pas un instant perdre de vue la question capitale de sa tâche, qui est l'appropriation absolue du bâtiment de l'école à ces facteurs impératifs de l'hygiène: Pénétration intense des rayons lumineux, aération efficace des moindres parties de l'édifice.

Ce qu'il y a de remarquable, disons-le tout de suite, c'est qu'en *s'inspirant de ces méthodes saines et rationnelles, on n'ira pas au devant de nouvelles dépenses, bien au contraire.* Nous estimons pour notre part que la dépense faite pour la construction des écoles, est en général trop élevée et cela précisément parce qu'on sacrifie le nécessaire au superflu, la seule chose importante, les conditions hygiéniques, à des effets purement extérieurs.

Les progrès modernes dans la fabrication et l'emploi des matériaux économiques basés notamment sur la série des agglomérés qui ont

rendu déjà tant de services, ne sont plus discutables. *L'école de demain, qui de plus en plus doit répondre à des conditions sévères d'économie dans l'emploi des deniers publics, devra faire une large place à ce genre de matériaux.*

L'économie ainsi réalisée dans les constructions sera employée avant tout à agrandir les terrains scolaires, à qui aura pour conséquence immédiate d'étendre davantage en surface ces bâtiments au lieu de les élever en hauteur, de respecter enfin les principes fondamentaux de leur orientation et d'aménager alentour les plantations et la verdure dont l'importance de premier ordre n'est plus à démontrer.

Le programme tient dans ces deux mots: Hygiène, économie.

La découverte qui à l'heure actuelle doit prendre le pas sur tant d'autres, est celle de l'action fondamentale exercée par les rayons obscurs ultra-violets du spectre solaire sur les organismes vivants.

Ces rayons mélangés aux sept couleurs visibles du prisme, dans une proportion énorme, puisque à eux seuls ils occupent trois fois autant d'espace que les autres, sont de nature à bouleverser tous les vieux préjugés des foules sur l'action de la lumière, et à confondre toutes les ignorances.

Les constructions humaines doivent parsuite être établies sur des bases toutes nouvelles. Lentement, mais sûrement, les conséquences s'en imposeront peu à peu dans le domaine des bâtiments de tous ordres. Dès maintenant ils peuvent être l'objet d'applications pratiques. Aucun édifice plus que l'école n'en a autant besoin.

On ne saurait en effet trop insister sur cet agent primordial de salubrité que sont les rayons solaires à la fois comme action d'éclairage pour maintenir dans les meilleures conditions d'équilibre les qualités natives de l'œil de l'élève, et comme facteur intense d'épuration microbienne de l'atmosphère de la classe comme de tout ce qu'elle contient.

La question d'éclairage domine ainsi toute la construction de l'école. La distribution des rayons lumineux passe avant l'aération, avant même le chauffage.

Il ressort des enquètes et des inspections de médecins-oculistes dans les écoles de divers pays, que la plupart d'entre elles n'ont pas été construites en vue de leur éclairage, et ont pour conséquence d'atteindre la vue de leurs élèves. *On peut presque établir comme loi qui découle de ces mauvaises installations que plus les études se prolongent sur un grand nombre d'années, plus la vue de l'élève en souffrira.* Les plus intéressantes constatations ont été faites à tous les âges des écoliers, et ont données des résultats très intéressants, suivant la latitude des villes examinées et surtout la race des écoliers. Il ne faut pas oublier en effet que la faculté visuelle de chaque race a une influence qui ne saurait étonner sur les statistiques qui ont été publiées.

Il est donc de haute importance pour l'hygiène de l'école de considérer aujourd'hui comme facteur principal, autour duquel les programmes de la construction et d'organisation des écoles modernes doivent évoluer, l'éclairage rationnel de la table de chaque élève ainsi que l'éclairage direct de toutes les parties de l'édifice.

On a beaucoup étudié la disposition des fenêtres, leur position pour l'éclairage monolatéral, qui semble, dans la plupart des cas, préférable à tout autre.

Dans la formule de surface de la fenêtre, un rapport étroit s'établit avec la hauteur, la profondeur de la classe, son orientation et son degré de dégagement d'autres édifices au-devant. *La fenêtre a toujours été considérée comme devant être nécessairement dans un plan vertical. C'est là encore une habitude, diros-nous une routine?* Lorsque l'on étudie la direction des rayons lumineux dans une classe, et à quel point il importe que la lumière pénètre surtout par la partie supérieure des ouvertures, on est logiquement amené à une nouvelle transformation. Si l'on veut atteindre à la logique scientifique, il importe de diminuer la surface du plafond de la classe en construisant les fenêtres sur plan incliné. L'inclinaison théoriquement parfaite forme un angle de 45° avec le plan horizontal. *Une fenêtre peut atteindre de cette mainère son maximum de rendement enfiltrant la totalité des rayons que présente le segment moyen allant de l'angle de 30° à l'angle de 60° sur l'horizon. Ces dispositions que nous regrettons, faute de place de n'exposer ici que très sommairement pour la première fois, conduisent au résultant inespéré du maximum d'éclairage de la classe, même par les jours les plus gris.*

L'éclairage naturel de l'école, qui à première vue semblerait si facile à obtenir, présente au contraire, dans sa solution parfaite, de nombreuses difficultés.

Il est sous l'influence directe du climat et des conditions météorologiques de chaque ville. L'usage des locaux scolaires étant de huit et dix mois de l'année, il est rationnel, avant d'arrêter le plan de ces bâtiments, de connaître quelles sont les conditions d'éclairage du lieu, le nombre moyen annuel d'heures, d'ensoleillement le nombre moyen de jours de temps couvert, de temps très couvert. Las tables météorologiques qui ont été dressées, parfois avec un soin extrême pour certains points d'Europe et d'Amérique, constituent le plus précieux instrument de travail. On doit les consulter avec grand soin lorsqu'il s'agit de créer des bâtiments quels qu'ils soient, du reste, mais surtout des bâtiments scolaires.

En généralisant les observations de ce genre, elles donneront les éléments fondamentaux du programme qu'il convient d'adopter dans chaque ville. Cet équilibre moyen qui s'établit sur une longue période d'observations, entre les jours de soleil et les jour sans soleil—définition qui répond à certaines données rigoureuses du climat d'un lieu

déterminé—est nécessaire à connaître avant d'établir les plans d'une école.

Les donnés météorologiques du lieu une fois connues, il sera alors possible de déterminer la meilleure orientation pour l'éclairage des classes. La forme même des bâtiments scolaires en sera la conséquence.

Sans entrer ici dans des discussions souvent contradictoires, qui ont eu lieu pour recommender telle ou telle orientation, il faut établir qu'il est irrationnel de considérer qu'une même orientation des bâtiments scolaires peut répondre à toutes les villes d'un même pays. *Les observations météorologiques, qui comprennent non seulement l'éclairage, mais les vents, le degré hygrométrique de l'air, les pluies, les neiges, doivent être attentivement consultée.* Dans certains lieux l'exposition N. E. ou N. O. peut être recommandée, dans d'autres l'orientation peut osciller dans un angle plus étroit de 30° autour de la ligne nord sud. Une certaine marge dans ces limites permet, suivant les conditions spéciales du lieu, d'orienter au mieux les plans de l'école.

On a dit que l'action directe des rayons du soleil, que l'on reconnaît si indispensable pour la chambre d'habitation, l'était infiniment moins pour la classe où cependant les enfants passent une partie de leur jeunesse sur les bancs de l'école. Nous ne pouvons admettre de pareilles distinctions.

Le soleil, dont l'action est à la fois microbicide et désinfectante par excellence, ne doit pas avoir une action prépondérante seulement dans la chambre où loge l'enfant en famille, mais aussi dans celle où il reçoit l'enseignement.

Sans suivre les discussions sur l'éclairage unilatéral, bilatéral, ou multilatéral, ce qu'il importe c'est d'obtenir une lumière diffuse intense. Que l'on se protège pendant les heures mêmes de la classe des rayons directs solaires, est évidemment une nécessité, mais ce qu'il faut obtenir, c'est que pendant l'absence des élèves, l'action directe des rayons solaires soit suffisante pour supprimer et tuer tous germes morbides.

A cet égard l'orientation a une importance capitale.

Il importe par-dessus tout que l'école, l'école du premier âge au moins, arrive à remplir presque les conditions heureuses de la vie en plein air. C'est la vie idéale du dehors qui rend la jeunesse forte et joyeuse.

Nous sommes d'ailleurs d'avis, dans cet ordre d'idées, de donner une extension croissante aux écoles en plein air. Nous en sommes les partisans convaincus.

Nous ne prétendons pas que cela sera toujours aisé ou que dans le voisinage immédiat des grandes villes la solution sera toujours possible. Mais nous estimons que dans la belle saison, pendant trois ou

quatre mois, pour le moins on doit songer à exporter les enfants en pleine campagne au moment de cette éclosion qui chaque année renouvelle la vie de la terre et dont les phénomènes analogues sont maintenant si connus chez l'enfant en croissance.

A l'époque où la nature se réveille, pendant ces mois bienfaisants du printemps où la température favorise cet exode des petits écoliers, il devient nécessaire de rechercher une solution pratique à l'école en plein air. Elle variera selon les pays, les climats, les mœurs locales, mais le moment est venu pour chaque pays de la résoudre à sa manière.

L'école en plein air n'est pas un de ses rêves utopiques, comme on a cherché à l'insinuer. Avec de la prudence, de la méthode et surtout de la patience, on peut prétendre, dans un très grand nombre de cas, l'installer avec un plein succès.

Nous avons visité maintes écoles en plein air, nous en avons vues en Amérique. Ces visites nous ont démontré à quel point cette vie libre des poumons de l'enfant dans une atmosphère continuellement renouvelrée et pure, où se jouent les rayons du soleil, est efficace pour le jeune être humain à l'époque où sa croissance reprend une activité nouvelle.

Il faudrait pour bien faire que les écoles d'hiver soient le plus souvent doublées par une installation d'écoles en plein air.

Lorsque les espaces seraient suffisants, la solution économique et rationnelle serait pour la même construction de la transformer d'école relativement close pour l'hiver, en école toute ouverte pour l'été. C'est au printemps surtout qu'il faudrait décupler, au profit des enfants, les bienfaits salutaires du soleil et de l'air pur.

L'espace et la verdure maintenus obligatoirement tout autour des bâtiments de l'école auront des conséquences capitales pour la santé des petits écoliers. Il faut arriver logiquement, et de la façon la plus pratique qu'il soit, à donner l'orientation la plus favorable aux salles d'école. S'il pouvait y avoir des locaux pour le matin et pour l'après-midi, la solution serait idéale.

Les classes du matin seraient orientées au couchant, tandis que celles de l'après-midi, avant de recevoir les enfants, auraient profité de la large pénétration des rayons solaires souverainement microbicides.

Ou bien encore, le matin serait réservé aux exercices ou aux tenues de classes en plein air, et l'après-midi les salles qui auraient reçu le soleil toute la matinée abriteraient les enfants dans les conditions hygiéniques parfaites.

Mais avant tout l'importance de l'espace et de la verdure tout alentour de l'école est capitale.

Pour l'éducation, pour la vie physique et morale de l'enfant, le jardin est indispensable, il est l'agent souverain de la santé en même

temps que l'élément par excellence pour provoquer la vie heureuse des écoliers.

L'enfant des villes a ainsi l'illusion de la petite campagne, la nature lui découvre et lui raconte peu à peu ses mystères et ses secrets. Etre initié par un maître sans le ramener en classe à la vie des plantes, lui ouvre un horizon qu'aucun autre enseignement par l'image ne saurait faire. Ce point est capital pour contribuer à l'hygiène scolaire dans son acceptation la plus haute et la plus large.

Chez tout enfant il y a un petit cultivateur qui sommeille! Si on lui donne l'illusion de posséder un petit carré de terre, cet instant se réveillera. Il faut qu'il sente que ce qu'il cultive est bien à lui et qu'on ne le lui enlèvera pas. Les joies simples du plein air sont les plus fortes. Elles sont faites de l'harmonie des sentiments qui relient l'homme, l'enfant à tout ce qui vit autour de lui—lumière, eau, ciel, nuages, verdure, arbres, plantes, animaux.

L'enfant et le tas de sable, par exemple, c'est tout un poème, ce poème qu'aurait voulu vivre tout enfant.

S'amuser avec du sable permet à l'enfant les plus delicieuses créations, c'est le premier pas de l'imagination créatrice qui se développe peu à peu en mille combinaisons, en mille aventures, en recherches presque savantes.

L'enfant de cinq ans devient déjà presque un maître dans le maniement de la matière obéissante, douce, moelleuse . . . soyeuse. Où mettre le tas de sable si ce n'est pas en plein soleil? Il faut donc de la place, et bien disposée, non pas à l'ombre de l'école, mais dans les parties le plus dégagées.

L'ignorance de l'enfant des villes est extrême en tout ce qui touche les spectacles de la nature. L'école froide avec ses classes rébarbatives et peu esthétiques n'est pas faite pour lui donner des notions des splendeurs simples et grandes qui l'environnent. Les phénomènes les plus ordinaires de la vie du ciel, des plantes, de l'air, du soleil, lui sont trop souvent inconnus. La vie des grandes villes oblitère les sens, les sentiments naturels de l'homme et fausse chez l'enfant par avance le sens réaliste de la continuité des phénomènes de la vie. La vie de l'écolier, conséquence de l'organisation scolaire et des bâtiments de l'école ne peut plus, au milieu de l'évolution générale du monde, ne pas progresser. Il faut qu'elle s'ouvre logiquement à tout ce qui permettra à l'enfant de se mouvoir, de s'ébattre, même de travailler en plein air. Il faut faciliter à l'enfant le goût de s'occuper en plein air. Cela développera avant tout sa personnalité, sa volonté.

L'importance de la vie simple, naturelle, est énorme pour la formation du caractère de l'enfant; l'influence des jeux est à cet égard considérable.

Chercher à savoir l'attitude dominante de l'enfant c'est en grande partie par la vie du dehors q'uon y parviendra.

C'est au fond tout le secret de l'éducation humaine; à tout âge on peut se découvrir des qualités qui ont longuement sommeillé en vous et qui ne se sont révélées qu'a la suite de circonstances accidentelles.

Faisons donc s'ébattre l'enfant sous le grand soleil fortifiant qui lui donner à la foie de vivre, la force de travailler et plus tard de lutter.

Un point sur lequel on n'a pas assez attiré l'attention est celui du mobilier scolaire.

Le mobilier des classes, pupitres, chaises et tabourets, doit être combiné de manière à ce que l'enfant puisse se lever quand il le veut et continuer à lire ou à écrire debout. L'habitude néfaste passée à l'état de dogme qui veut que l'écolier soit cristallisé à sa place et que plus il s'y tient immobile, mieux il est noté, est un non-sens hygiénique et une absurdité.

Elle ne fait que favoriser au nom d'une prétendue sagesse disciplinaire l'attitude vicieuse de l'écolier, qui assis d'une manière défectueuse en recueille trop souvent les funestes conséquences comme la myopie, la déviation du torse, le rachitisme.

Un membre qui ne se meut pas se paralyse progressivement. Il faut assurer le mouvement nécessaire et indispensable à tous ces petits corps en croissance. S'il leur faut du mouvement au dehors, à la récréation, il leur en faut aussi dans la classe elle-même.

C'est pour cela qu'il faut que l'écolier puisse écrire et lire aussi bien debout quand il le désire qu'assis. L'enfant sent la vie s'agiter en lui avec plus de puissance que l'homme, il faut qu'il puisse manifester cette vie dans ses mouvements, même en classe.

Et il ne serait pas superflu, loin de là, que les parents soient mis à même et en demeure de connaître les notions d'hygiène les plus essentielles, afin d'en surveiller l'observance chez leurs enfants.

L'Architecte social a en mains une parcelle importante de l'avenir hygiénique du peuple.

Pour réaliser les progrès que l'on attend de lui, il doit renouveler entièrement les vieilles formules de construction et d'art tout à fait surannés et se rendre compte des besoins intenses qui se manifestent dans les masses populaires.

Si l'agglomération, principe sur lequel les villes modernes sont fondées et qui est si contraire à l'hygiène humaine, ne peut être réformée du jour au lendemain, les efforts de tous les esprits éclairés, de tous les techniciens surtout, doivent tendre à l'amélioration constante de sa structure en vue de la rendre moins insalubre.

Le rôle de l'Architecte, s'il est celui d'être un bon constructeur qui doit assurer la solidité de l'édifice qu'il construit, et d'un artiste dans

le sens élevé du mot pour le revêtir de beauté, est aussi et avant tout à notre avis celui d'être le premier hygiéniste de la cité, celui qui recherchera dans toutes les circonstances, dans quelles mesures il peut améliorer les conditions générales de la santé publique.

La caractéristique des édifices consacrés aux services généraux de la communauté doit être de remplir avant tout des conditions essentiellement hygiéniques. Il n'en seront pas pour cela des édifices laids. La beauté n'est-elle pas faite avant tout de la raison d'être d'un édifice, de ses proportions en harmonie avec ses besoins logiques?

Pour la réalisation de ce programme, surtout en ce qui concerne les bâtiments scolaires, il faut résolument prendre la pioche du démolisseur en face de ces conceptions puériles, qui consiste à dépenser l'argent des municipalités et des contribuables à créer de brillantes façades, de purs décors de théâtre. Il faut porter tout l'effort à faire concourir les moindres sommes dépensées à l'hygiène et au bien-être de ceux qui doivent habiter l'édifice.

Il y aujourd'hui, heureusement, une grande pousée en faveur de l'application de ces principes universels, qui seront le salut des nations, l'air et la lumière partout, le soleil dans toutes les demeures.

C'est en se conformant à ces règles primordiales, en se faisant le serviteur, le propagateur, l'exécuteur et l'apôtre de ces grandes lois de l'hygiène, que l'Architecte sera le bienfacteur de la cité moderne.

CONCLUSIONS.

L'école de l'avenir doit placer l'enfant, pendant toute la durée de l'enseignement, dans les conditions normales du plein air. Par sa construction et son aménagement rationnels, elle doit participer à cette évolution qui entraîne actuellement l'organisme social tout entier vers l'amélioration des conditions d'existence de la masse du peuple.

En appliquant ce programme:

1. L'école de l'avenir doit occuper des espaces de terrains assez vastes pour être de plus en plus isolée des autres bâtiments et entourée de toutes parts de verdure, dont les influences bienfaisntes sur les conditions de l'atmosphère, comme sur celles de la vie normale de l'individu, sont incontestables.

2. Dans l'école de l'avenir il faut pour la forme et l'orientation donnée à ses différents éléments, chercher, avant toute chose, à faciliter la pénétration directe des rayons solaires, et conduire, pour ainsi dire, jusque dans ses moindres recouis l'air purificateur.

3. Dans la construction de l'école de l'avenir l'économie la plus attentive doit être observée dans le choix des matériaux, leur mise en œuvre qui doit concourir l'agencement et à l'organisation pratique de l'école. Il ne s'agit plus de céder à la tentation de produire des architectures somptueuses, il s'agit de créer des formes simples, bril-

lant plus par l'habile ordonnancement des besoins hygiéniques, que par la profusion des moulures et des matériaux de luxe.

Il peut être intéressant de rappeler ici que, sur notre proposition le Congrès International d'Hygiène Scolaire de Paris, tenu en août 1910, adopta dans sa séance solennelle de clôture les vœux suivants.

Le Congrès estimant qu'un édifice peut être beau par la seule harmonie et la simplicité de ses lignes, que les bâtiments scolaires doivent être isolés et entourés de jardins.

Emet les vœux:

1. Que l'architecture scolaire réforme ses méthodes coûteuses de constructions et de décorations extérieures, les dépense devant se concentrer surtout à l'intérieur pour l'organisation rationnelle et hygienique de l'école.

2. Que toute école soit construite sur un terrain suffissamment vaste pour que ses bâtiments soient isolés de tous les autres rationnellement orientés et puissent être toujours entourés de jardins.

THE EFFECT OF HUMIDITY, TEMPERATURE, AIR MOVEMENT, AND BAROMETRIC PRESSURE ON THE BLOOD PRESSURE, PULSE, AND RESPIRATION OF CHILDREN UNDER THE INFLUENCE OF VARIOUS FORMS OF VENTILATION.

B. Raymond Hoobler, A. M., M. D., New York City.

The various meteoric conditions which enter problems of ventilation have been studied for some time past. These conditions are becoming more and more recognized as important etiological agents in the maintenance of health and the production of disease, and so are receiving more attention both from climatologists and from experts in ventilation. Their importance, therefore, warrants careful investigation on the part of the medical profession.

From an engineer's point of view the standard of ventilation is expressed thus: "The perfectness of the ventilation in a room is ordinarily determined by the amount of carbon dioxid gas."

Other writers point out the discomforts of poor ventilation as being excessive temperature, unpleasant odors, lack of moisture, too much moisture, and too little air movement.

In a recent article W. Gilman Thompson attacks the present methods used by the average engineer for determining the fitness of air for breathing. In lieu of the engineers' method, which he calls the physical method, he proposes a physiological method. The method followed by engineers and that suggested by Dr. Thompson are crudely tabulated as follows:

I. ENGINEERS' OR PHYSICAL METHOD.	II. SUGGESTED OR PHYSIOLOGICAL METHOD.
The thermostat and thermometer.	The use of the nose.
Cubic feet of air supplied per hour.	Blood-pressure tests.
Air analyses.	Metabolism tests. Volume and composition of expired air.
Hygrometry.	Symptom tests, as blood tests, headache, indigestion, dyspnœa, etc.

It will be seen at a glance that these two methods are diametrically opposite, for one deals with the man and the other with the environment. Yet the second method has been so much neglected that few reliable data are obtainable concerning it, while the first is supported by volumes of highly impressive theoretical calculations.

It is evident that the engineers have in times past considered the problem as being that of a "room" to ventilate and not "a man" to be ventilated.

From an unsuspected source there has been collected a mass of information which has a direct bearing on ventilation problems. This source is the calorimeter. The classical standard for what seemed good ventilation has been overturned by the data obtained through observations made by means of the Atwater & Benedict calorimeter, in this country, and through a similar apparatus in the hands of Flugge[2] and his pupils, of the Breslau laboratory. Through the researches of these investigators it was shown conclusively that carbon dioxide gas was not as poisonous as believed, since individuals have remained in sealed chambers in which the per cent of this gas was as many as 161 times as great as in normal air, with apparently no injurious effects.

Paul[3] carried out an experiment on himself. He remained 4½ hours in a sealed chamber. Data obtained was as follows:

Temperature.		Humidity (relative).		Carbon dioxid parts per 1,000.	
Beginning.	End.	Beginning.	End.	Beginning.	End.
14	17.2	49	61	0.5	16.1

The carbon-dioxide standard, so long in vogue, took into account only the air in its function as oxygen and carbon-dioxide carrier, leaving out entirely its function as moisture and heat carrier as well as its effect on the vasomotor and other reflex nervous apparatus.

The time has come when we must take a broader view of the function of the atmosphere. We must take into account the air in which we live and not simply the air we breathe.

Most of the discomforts of poor ventilation have to do with air in its effect on the body other than as a means of respiratory exchange. For example, the question of drafts. From the standpoint of respiratory exchange we are benefited by the fresh air brought us by such air currents, but the effect of such air currents on the vasomotor apparatus is quite another matter. Again, air heavily laden with moisture may be well breathed and feel soothing to the mucous membrane; but such air, already saturated with moisture, will take up no more, so that the whole body becomes bathed in perspiration, and the vasomotor and heat centers are worked overtime to accommodate the body to such an environment.

It will be seen, therefore, that air fit to breathe in meets but one requirement—it must be fit to live in. In other words, we are as much affected by the air surrounding us which we do not breathe as by the air we do breathe. Taking this viewpoint, we must inquire in what ways the air which surrounds us but which we may never breathe acts on the body.

I. The most important action is by virtue of the ability of the air to absorb moisture. Evans [4] states:

> The body is constantly giving off moisture to the air. It is estimated that the amount which a healthy person gives off by the skin and lungs together is about 550 grains per hour, which is enough to raise the relative humidity of the vapor in 380 cubic feet, at 60° F., from 75 per cent to complete saturation.

II. The body is also constantly giving off heat. It is estimated that 200 British thermal units are given off in a day for each child and about 500 British thermal units for an adult. The relationship of the heat and moisture in the air is a very close one. H. M. Smith,[5] quoting Warren S. Johnson, says:

> It is a curious fact that it is only through the moisture in the air that it retains heat. Heat naturally radiates from all bodies that are warmer than their surroundings. If the air has little or no moisture in it, the radiated heat goes right through it without warming it. But if it is moist it stops the radiated heat and the moisture is heated. If it were not for the moisture in the air, it would be too cold to live in.

III. Another factor in the air which is constantly affecting the body is the atmospheric pressure. This pressure is constantly changing, and the body is subjected in the vicinity of New York to a change in altitude of approximately 2,500 feet within the space of a few hours.

IV. The vasomotor apparatus is constantly being played upon by the atmospheric environment, one moment opening superficial capillaries, the next moment closing them, in order to maintain circulatory equilibrium. And not only the superficial capillaries, but the large splanchnic area, is at the mercy of environment through reflex action.

V. The body is constantly being stimulated by fresh air or depressed by superheated air. Certain cases, in which there is nervous instability, are greatly stimulated by the fresh open air. It is remarkable how many cases of chorea which have been in the wards for months will quickly recover when sent to the country.

VI. The body, if remaining at rest for a time, naturally becomes a center of vitiated air, which needs to be removed (air envelope of Heymann). Therefore the air, in its function of motility, has an important bearing on the human mechanism, in carrying away heat and moisture, and bringing fresh aid to be again laden.

Each of these functions of the air should be studied in its relation to the human organism, and their interrelationship must also be considered. The subject is complex. The following tabulation sums up the main features, thus:

Functions of the air due to its—	Functions of the air—their effects on man as shown by changes in—
Moisture.	Blood pressure.
Temperature.	Pulse rate.
Movement.	Respiration rate.
Atmospheric pressure.	Metabolism.
Stimulating or depressing effect.	Nervous phenomena.

All of the above have to do with the effect of air on the surface of the body and do not take into account the air in its function as a means of respiratory exchange.

With many divergent views, it seems advisable to attempt to elicit some data from the individual who is to be ventilated, rather than to study the room which is being ventilated.

No single criterion can be relied upon, but all the data which can be obtained should be considered. No system of ventilation can be counted perfect which (1) causes the pulse to beat unusually fast or slows it unduly; (2) causes rapid or increased respiration or unduly retards it; (3) causes blood pressure to fall below the normal or so changes it as to be inimical to the welfare of the individual.

The ventilation variants in a hospital ward or schoolroom are in the main humidity, temperature, air movement, and barometric pressure. We shall try to point out that each of these by itself may have an effect for good or ill upon the human organism.

The data collected comprise an accurate reading of the temperature of the ward and out-of-door temperative, relative humidity indoors and out of doors, pulse rate, respiration rate, blood-pressure readings, both systolic and diastolic; hourly barometric pressure was recorded and furnished through the courtesy of the United States Weather Bureau.

We will take up these functions of the air, viz, humidity, temperature, movement, pressure, and see if our knowledge of their effect

upon the human body can be made of service in determining how best to obtain the maximum degree of efficiency of such function for the human mechanism.

HUMIDITY.

Many writers have contributed to the present knowledge of humidity in its relation to heating and ventilating problems. J. R. Allen,[7] speaking from an engineer's standpoint, says:

> When air is very dry it is necessary for a room to have a much higher temperature, in order that it may feel comfortable, than when the air is moist. It is therefore important that we keep the humidity at a point as high as consistent with satisfactory operation. Cold air contains proportionately less moisture than warm air, and therefore when cold air is heated and brought into a building it should be moistened in order to keep a proper per cent of humidity. The average humidity in the Northern States is about 70 per cent; in the arid regions of Arizona and New Mexico it may be as low as 20 or 30 per cent. In cold weather, if the humidity of the outside air is 70 per cent, and this air is heated and brought into the room without moistening, its humidity may be reduced as low as 30 or 35 per cent, thus making the air as dry as in the most arid regions. This produces a serious effect upon the inhabitants and furniture of the room.

Dr. H. M. Smith,[5] speaking from the standpoint of a physician, states:

> It has been mentioned that the feeling of comfort was greatest in a room of 65° F., with a relative humidity of 60 per cent, produced by artificial means. It was most interesting and instructive, in connection with this matter, to find that, on the perfect days of May and early June, with all the windows opened and admitting freely the outside air, the thermometer stood at from 65° to 68° F., and the hygrometer registered about 60 per cent relative humidity. Generally speaking, dry air is an excitant often causing sleeplessness and irritability, accompanied by a drier skin and quickened pulse. Moist air is more of a depressent, producing quiet sleep and slower circulation of the blood.

Dr. Thompson,[1] already quoted, while agreeing that the humidity arising from letting in the open air is most satisfactory, yet believes that "air which has been superheated and then moistened with steam or water spray in an artificial ventilation system is never quite the same as natural air."

P. W. Goldsbury,[8] in discussing humidity, says:

> The problem of building is to make indoor humidity more nearly like outdoor humidity.

Some work has recently been done in studying the effects of warm humid atmospheres on man by Collis and Pembrey.[18] Their work was done in the English cotton-weaving industry, which industry requires a warm moist atmosphere. They found that the temperature gradually rose from 68° to 101° F. on day of observation; that the relative humidity remained about the same, although the actual humidity was greatly increased. Under these conditions the pulse rate

increased from 80 to 118, and respirations from 18 to 29. In another experiment, in which the temperature rose from 70° to 92° F., the relative humidity rose from 51° to 82°. Under these conditions there was an increase in the pulse rate from 80 to 102. They summed up their findings thus:

> The influence of warm moist atmosphere has a tendency to throw a tax upon the powers of vascular accommodation, as indicated by low-blood pressure, notwithstanding the rapid rate of the pulse.

Paul,[3] in studying the causes of discomfort of rooms, considers the most important factor that of humidity. One of his experiments is related: Patient placed in sealed chamber. Temperature at beginning 22.5° C. Relative humidity 50 per cent. Humidity was quickly raised to 76 per cent and temperature to 30° C. Under these conditions, the chamber became uncomfortable in five minutes; whereas a much longer time elapsed before chamber became uncomfortable, when humidity was not raised so rapidly or to so great an extent.

Ercklentz,[9] studying the chemical contaminations of the air in a closed chamber, believes such contamination to be without effect, and concludes with Paul, that the discomfort arises from the moisture and temperature of the surrounding air.

In order to obtain data concerning the relation of indoor humidity to outdoor humidity, and to the various changes in pressure, pulse, and respiration, a series of observations were made with and without the use of the humidistat connected with the hospital ventilation system. A study of the relation of indoor and outdoor humidity, on succeeding days, with the humidistat, admitting different amounts of moisture, is first presented:

January 24.—Engineer's data concerning ventilation system: All inside coils on. Temperature in duct, 60° open. Fan, 134 revolutions, ninth notch. Humidistat full on closing and opening every 2 minutes. Temperature of ward, 70° F.

Humidity observations: Average of 6 observations, taken between 9 a. m. and 6 p. m. in ward, relative humidity 51.2 per cent. Average of 6 observations taken at same hours outside, relative humidity 59.5 per cent.

January 25.—Engineer's data: All inside coils on. Temperature of duct, 59–61° open. Fan, ninth notch, 134 revolutions. Humidistat at medium on and off every 2 minutes.

Humidity observations: Average of 5 observations, taken between 9 a. m. and 3 p. m. in ward, relative humidity 33.4 per cent; outside relative humidity, 56 per cent, being the average of 5 readings taken at same hours as noted for inside.

January 26.—Engineer's data: All inside coils on. Temperature of duct, 59–65°. Closed at 65°. Fan, ninth notch, 134 revoluions. Humidistat off.

Humidity observations: Six observations, between 9 a. m. on January 26 and 9 a. m. on January 27 in ward, relative humidity, 37 per cent. Average of 6 observations taken at same hours outside, relative humidity, 72 per cent.

January 27.—Engineer's data: Inside coils all on. Air in duct, 42°. Fan, ninth notch, 134 revolutions. Humidity full on.

Humidity observations: Average of 5 observations, taken between 10 a. m. and p. m. in ward, relative humidity, 36.4 per cent. Average of 5 observations, taken at same hours outside, relative humidity, 78.4 per cent.

The average for these four days in which the humidity apparatus was tested gives inside humidity 40 per cent, and outside, taken over the same period of time, average 66 per cent; average temperature inside, 68.5°; outside, 21°. On the four succeeding days the humidity in the ward was controlled entirely by opening and closing windows, the humidity apparatus being shut off. The average for the four following days was, indoor humidity, 41 per cent; outside humidity, 76 per cent; average temperature inside, 65.5°; outside, 28°. On the four days in which the humidity apparatus was in use the ward was kept closed, except in so far as it was necessary to open and close doors leading to balconies.

From the above observations it appears that by judicious use of the open window the indoor humidity may be kept at about the same per cent as with the use of the humidistat. No doubt it requires more fuel to keep the temperature of the ward at 65° by the open-window method.

Another series of observations, taken in different wards, when the temperature was higher shows, in general, the same results. For example, the average humidity, by open-window method, during a portion of April and May, 1912, in three different wards was as follows: 44.2, 45.3, and 47.2 per cent, while the average outside humidity was 59 per cent. During the same period the indoor temperature was 65.4°, 67.5°, 63.9°, with an outdoor temperature of 57°. It will be seen from the above figures that by the open-window method there is an average of 15 per cent difference in the relative humidity indoors and out of doors and a difference in temperature of 7°.

During these observations a series of blood-pressure readings was taken. Only such patients as were confined to their beds and who had no increase in temperature were considered. The pressures were taken about the same time each day, using the same arm, and results were recorded day by day by the writer without any knowledge of the previous day's findings. The blood-pressure readings were taken by means of the automatic device for indicating systolic and diastolic blood pressure, as devised by the author.

A group of about 10 patients were examined and blood pressures recorded in each of the 3 wards each day. The pressures were then added together and an average for the ward for that day determined. The same patients were examined the following day and an average struck. It is this average pressure which I have used in compiling my data, since it is obvious that the average of a number

of pressures would furnish a better basis for study than individual blood pressures.

The same method was carried out as regards pulse and respiration. The relative humidity was determined by the use of the Sling psychrometer, and the tables of the United States Weather Bureau used in computation.

BLOOD PRESSURE AND HUMIDITY.

Systolic blood pressure and humidity.—Of all cases showing a falling systolic pressure during a changing humidity 67 per cent occurred during a rising humidity and 33 per cent during a falling humidity.

Of all cases showing a rising systolic pressure during a changing humidity 50 per cent occurred during a rising humidity and 50 per cent occurred during a falling humidity.

Of all observations taken during a rise or fall in humidity 60 per cent went in a reverse direction to humidity and 40 per cent went with the humidity.

Diastolic blood pressure and humidity.—Of all cases showing a fall in diastolic pressure during a changing humidity 67 per cent occurred during a rising humidity and 33 per cent during a falling humidity.

Of all cases showing a rise in diastolic pressure 60 per cent occurred during a period of falling humidity and 40 per cent during a period of rising humidity.

Of all observations taken showing a changing diastolic pressure during a changing humidity 65 per cent were in reverse order to humidity.

Of all observations taken 58 per cent were in a reverse order to humidity, 30 per cent were in the same order, and in 12 per cent either the diastolic or the humidity were stationary.

Pulse pressure and humidity.—Of all cases showing a fall in pulse pressure during a changing humidity 67 per cent occurred during a period of rising humidity and 35 per cent during a period of falling humidity.

Of all cases showing a rise in pulse pressure 46 per cent occurred during a period of falling humidity and 54 per cent during a period of rising humidity.

Of all observations showing a changing pulse pressure during a changing humidity 58 per cent were in reverse order to humidity.

Of all observations taken 55 per cent were in reverse order to humidity, 40 per cent were in the same order, and in 5 per cent either pulse pressure or humidity were stationary.

In a large number of the observations on systolic and diastolic pressure the variations in humidity were very slight, in fact not sufficient to produce any marked change in pressure. During those

periods in which the humidity varied considerably the results on blood pressure were much more marked, as is shown by the following figures: During the course of the observations there were 17 times when the humidity varied over 20 per cent within 24 hours. During these periods the blood pressure went in reverse order to humidity in 77 per cent of observations.

The combined effect of humidity and temperature on the blood pressure will be considered under temperature.

Effect of humidity on pulse rate.—A falling humidity was accompanied by an increase in pulse rate in 23 per cent and a decrease in 77 per cent of cases. A rising humidity was accompanied by an increase in pulse rate in 22 per cent and a decrease in 78 per cent of cases.

Combined effect of humidity and temperature on pulse rate.—A rising humidity and rising temperature was accompanied by an increase in pulse rate in 205 per cent and a decrease in 80 per cent of cases. A falling humidity with rising temperature was accompanied by an increase in pulse rate in 22 per cent and a decrease in pulse rate in 78 per cent of cases. A rising humidity with falling temperature was accompanied by an increase in pulse rate in 25 per cent and a decrease in 75 per cent of cases. A falling humidity and a falling temperature was accompanied by an increase in pulse rate in 25 per cent and a decrease in 75 per cent of cases.

Effect of humidity on respiration.—A falling humidity was accompanied by an increase in respiration rate in 46 per cent and a decrease in 54 per cent of cases. A rising humidity was accompanied by an increase in respiration rate in 33 per cent and a decrease in 67 per cent of cases.

Combined effect of humidity and temperature on respiration.—A rising humidity and rising temperature was accompanied by an increase in respiration rate in 40 per cent and a decrease in 60 per cent of cases. A falling humidity and rising temperature was accompanied by an increase in respiration rate in 55 per cent and a decrease in 45 per cent of cases. A rising humidity and falling temperature was accompanied by an increase in respiration rate in 25 per cent and a decrease in 75 per cent of cases. A falling humidity with falling temperature was accompanied by an increase in respiration rate in 25 per cent and a decrease in 75 per cent of cases. For the combined effects of humidity and barometer on pulse and respiration, see under Barometer.

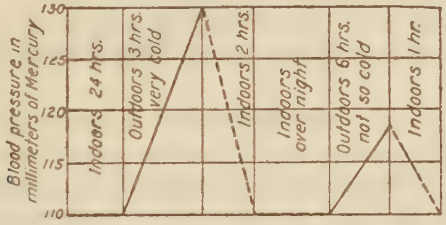
TEMPERATURE.

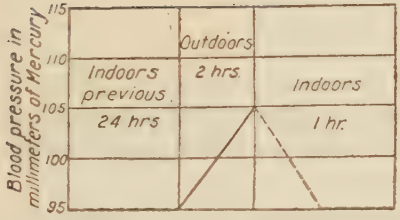
The temperature of the air has a very distinct relation to the blood pressure. The writer[10] observed that the effect of removing children with pneumonia from the warm ward to the cold, fresh air was to

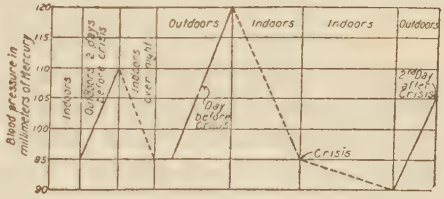
increase their blood pressures. This is true not only for pneumonia but for tuberculosis and a number of other diseases as well. Charts demonstrating the effect of cold fresh air in several conditions are shown here.

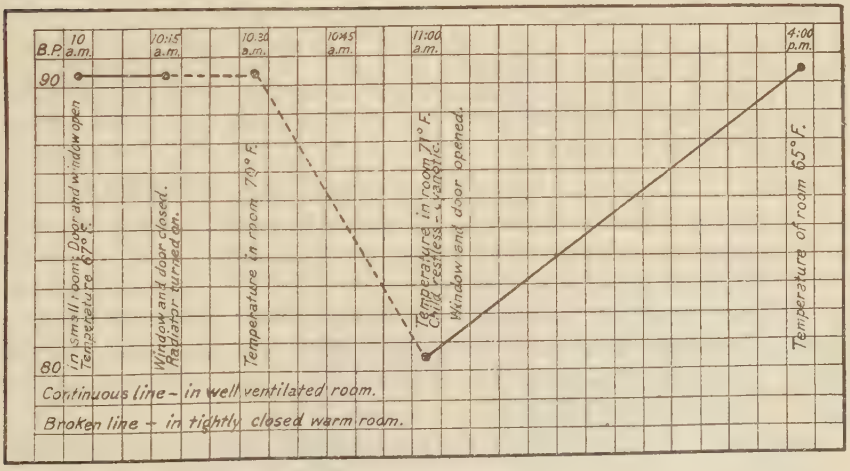
Not only has it been shown that cold air raises blood pressure, but it has also been shown that in a child with pneumonia, taken from the ward at a temperature of 65° and placed in an unventilated room with a temperature of 71°, the blood pressure will fall considerably.

The effect on the blood pressure of the cold fresh air is also obtained by placing the child in a cold, well-ventilated room. The chart also shows that the blood pressure varies with the temperature. During a period of low temperature the blood pressure was considerably increased.








B.P.
10 a.m.
10:15 a.m.
10.30 a.m.
10:45 a.m.
11:00 a.m.
4:00 p.m.
90
80
In small room 20 per cubic foot. Temperature 67° F. Window and door closed.
Window and door closed. Radiator turned on.
Temperature in room 70° F.
Temperature in room 71° F. Child restless — Yawning. Window and door opened.
Temperature of room 65° F.
Continuous line – in well ventilated room.
Broken line – in tightly closed warm room.

Other observers have noted the effect of temperature on blood pressure. L. S. Peters,[11] studying tuberculosis cases at Silver City, N. Mex., and referring to the effect of temperature on blood pressure, says: "Apparently the higher the temperature the lower the blood pressure."

Open air, regardless of temperature, has a decided effect upon the normal as well as the diseased individual. P. P. Eminet[12] examined a large number of healthy children from 7 to 15 years of age in an attempt to find out the influence of outdoor life on the pulse and blood pressure. His findings are summed up as follows:

> Children living out of doors show an increase in blood pressure, in some cases as much as 30 mm. of mercury. In only 7 out of 140 cases studied was there a decrease in pressure. The rate of the pulse was increased by outdoor life. Children living under good surroundings have, in general, a higher blood pressure than children living in poor surroundings.

The combined effect of humidity and temperature is shown in the following study:

Of all blood-pressure observations taken, the conditions which were most favorable in causing a fall in blood pressure were a rising humidity with a rising or falling temperature. The most favorable condition for raising blood pressure was a falling temperature, with an accompanying fall in humidity.

EXCHANGE OF AIR.

All systems of ventilation depend upon exchange of air and not of the purification of air already present. Hence, air movement is an important factor. J. R. Allen,[7] in "Notes on heating and ventilation," has this to say on air movement:

> In order that air in a room occupied by human beings may be reasonably pure, it should be diluted with fresh air. The amount of the dilution is usually determined by the per cent of carbon dioxide present, which is presumed to be proportional to the products of respiration. Air that contains more than 10 parts of carbon dioxide to each 10,000 parts of air is of an unhealthy quality. Air in living rooms should be changed two times each hour. In extreme cases the change of air is sometimes as high as 10 times per hour. If changed too frequently, drafts are caused.

Snow,[13] in "The ventilation of buildings," says that a velocity of air 1½ feet per second is not sensible to the senses, and a velocity of 3 feet per second, or about 2 miles per hour, causes no discomfort.

The effect of moving air on the pulse and blood pressure has recently been shown by Starling.[14] He states that "a cold wind has a definite influence in raising the pulse rate." Not only does a cold wind, but a mild breeze, and even the movement of air when sitting in an open street car affect the pulse rate.

Heymann[6] showed that the air immediately surrounding the body contained a much greater per cent of carbon dioxide than the room

air in which the person was sitting. The exact data of one of his experiments is presented: Inspired air contained 1.247 parts carbon dioxide per 1,000; room air contained 0.430 part carbon dioxide per 1,000.

BLOOD PRESSURE AND BAROMETER.

It has been known for a long time that barometric pressure affected the circulatory system, and the relation of this meteoric condition to pulse rate and blood pressure has been most carefully studied. R. P. Pomeroy[15] has gone over the literature and added his own observations and concludes that "the results of nearly all experimental data show that diminished barometric pressure lowers the blood pressure." C. F. Gardiner and Hoagland[16] showed conclusively that persons changing from an elevation of 6,000 feet to one of 14,130 feet experienced a fall in blood pressure and a rise in pulse rate.

Schneider and Hedblom,[17] working with an Erlanger sphygmomanometer, noted that "considerable elevation in altitude tended to lower systolic and diastolic blood pressure and increase the rate of the heart. The fall in systolic pressure is slightly greater and more certain to occur than the fall in diastolic pressure."

In studying the effect of the changes of barometer on the blood pressure, it was found that the systolic pressure rose and fell with the barometer in 57 per cent of the cases, and in 54 per cent the systolic blood pressure went in reverse order to the barometer.

In the observations on diastolic pressure it was found that 50 per cent went with and 50 per cent went opposite to the rise or fall of the barometer.

The pulse pressure followed the barometer in its rises and falls in 54 per cent of the cases and went opposite to the barometer in 46 per cent.

The above figures are based on very small rises and falls in the barometer. In every case in which there was a marked fall in barometer there was also a marked fall in both systolic and diastolic pressures. It was equally true that when there was a sharp rise in barometric pressure there was also a rise in systolic and diastolic blood pressures.

COMBINED EFFECT OF BAROMETER AND HUMIDITY ON BLOOD PRESSURE.

Systolic.—Observations taken during a rising barometer and a rising humidity showed a rise in systolic pressure in 30 per cent and a fall in 70 per cent. Observations taken during a falling barometer and a rising humidity showed a rise in systolic in 14 per cent and a fall in systolic in 86 per cent of cases. A rising barometer and falling humidity produced a rise in systolic in 50 per cent and a fall in 50 per cent of cases.

A falling barometer and a falling humidity produced a rise in systolic in 33 per cent and a fall in 67 per cent of cases.

Diastolic.—Observations taken during a rising barometer and a rising humidity showed a rise in diastolic pressure in 25 per cent and a fall in 75 per cent of cases studied.

Observations taken during a falling barometer and a rising humidity showed a rise in diastolic pressure in 14 per cent and a fall in 86 per cent of cases.

A rising barometer and a falling humidity produced a rise in diastolic pressure in 50 per cent and a fall in 50 per cent of cases.

A falling barometer and a falling humidity produced a rise in diastolic pressure in 33 per cent and a fall in 67 per cent of cases.

Pulse pressure.—Observations taken during a rising barometer and a rising humidity showed a rise of pulse pressure in 30 per cent and a fall in 70 per cent of cases.

A falling barometer and rising humidity showed a rise in pulse pressure in 28 per cent and a fall in 72 per cent of cases.

A rising barometer and falling humidity produced a rise in pulse pressure in 40 per cent and a fall in 60 per cent of cases.

A falling barometer and a falling humidity produced a rise in pulse pressure in 33 per cent and a fall in 67 per cent of cases.

Wherever there was a marked fall in barometer, with a marked rise in humidity, there was a fall in both systolic and diastolic pressures.

Combined effect of barometer, temperature, and humidity.

Barometer.	Temperature.	Humidity.	Effect on systolic pressure.		Effect on diastolic pressure.		Effect on pulse pressure.	
			Rise.	Fall.	Rise.	Fall.	Rise.	Fall.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
Rising	Rising	Rising	33	67	33	67	33	67
Do	do	Falling	40	60	40	60	80	20
Do	Falling	Rising	66	34	25	75	66	34
Do	do	Falling	43	57	43	57	30	70
Falling	Rising	Rising	.....	100	.....	100	.....	.....
Do	do	Falling	50	50	100	.....	.....	100
Do	Falling	Rising	50	50	50	50	50	50
Rising	do	Falling	33	67	.....	100	.....	.....
Falling	do	do	.....	.....	.....	.....	67	33

EFFECT OF BAROMETER ON PULSE.

A falling barometer was accompanied by a rise in pulse rate in 27 per cent of cases and a fall in pulse rate in 73 per cent of cases. A rising barometer was accompanied by a rise in pulse rate in 25 per cent of the cases and a falling pulse rate in 75 per cent of the cases.

The combined effect of humidity and barometer on the pulse rate. A rising barometer and a rising humidity was accompanied by increase of pulse rate in 25 per cent and a decrease in pulse rate in 75 per cent. A falling barometer with rising humidity was accompanied by a rising pulse rate in 20 per cent and a decrease in pulse rate in 80 per cent of cases. A rising barometer and falling humidity was accompanied by an increase in pulse rate of 17 per cent and a decrease in 83 per cent of cases. A falling barometer and a falling humidity was accompanied by an increasing pulse rate in 30 per cent and a decrease in 70 per cent of cases.

EFFECT OF BAROMETER ON RATE OF RESPIRATION.

A falling barometer was accompanied by an increase in rate of respiration in 54 per cent and a decrease in rate in 46 per cent of cases. A rising barometer was accompanied by an increase in respiration rate in 11 per cent and a decrease in 89 per cent of cases.

COMBINED EFFECT OF HUMIDITY AND BAROMETER ON RATE OF RESPIRATION.

A rising barometer and a rising humidity was accompanied by an increase in respiration rate in 25 per cent and a decrease in 75 per cent of the cases. A falling barometer with rising humidity was accompanied by an increased respiration rate in 40 per cent and a decrease in 60 per cent of cases. A rising barometer and falling humidity was accompanied by an increased respiration rate in 17 per cent and a decrease in 83 per cent of cases. A falling barometer and falling humidity was accompanied by an increased respiration rate in 70 per cent and a decrease in 30 per cent of cases.

From the foregoing it would seem that the most favorable conditions for maintaining the blood pressure at normal are those present in open air. To obtain the same result indoors, such methods of ventilation should be employed as to approximate the conditions out of doors. In unventilated rooms and in rooms having poor ventilation the tendency is to depress the circulatory system and reduce blood pressure, particularly if temperature and humidity are increased.

After several years' study of this problem the writer is thoroughly convinced of the desirability of having open-air balconies connected with every hospital ward and patients properly protected, exposed to the beneficial effects of the open, moving air.

SUMMARY.

1. The human body is affected by the air which surrounds it as well as by the air which is breathed.

2. Air conditions which most affect the circulatory system of the body are amount of moisture, degree of temperature, force of air movement, and atmospheric pressure.

3. A marked increase in relative humidity tends to depress the circulatory system and to decrease the blood pressure.

4. A marked decrease in temperature tends to stimulate the circulatory system and increase the blood pressure, particularly in those diseases in which there is instability of the vasomotor system, as, for example, pneumonia, and tuberculosis.

5. A marked increase in barometric pressure tends to increase blood pressure.

6. When the three factors—temperature, humidity, and barometric pressure—are considered together their influence on the blood pressure is in the order stated.

7. The effect of temperature, humidity, and barometric pressure on the rate of pulse and respiration is slight when variations are within narrow limits, such as may occur in the average hospital ward.

Under conditions where temperature and humidity are greatly increased there is a marked increase in rate of pulse and respiration. A marked fall in barometric pressure tends also to increase the pulse and respiration rate.

8. The method of ventilation best adapted to the maintenance of blood pressure is that which most nearly approximates out-of-doors conditions.

BIBLIOGRAPHY.

1. Thompson, W. Gilman, M. D.: The Heating and Ventilating Magazine, May and June, 1912.
2. Flugge, C.: Zeits. f. Hyg. u. Infectionkr., Leip. 1905, vol. 49, pp. 363–388.
3. Paul, L.: Zeitsch. f. Hyg. u. Infectionkr., Leip. 1905, vol. 49, pp. 405–432.
4. Evans, W. A., M. D.: Heating and Ventilating Magazine, Feby. 1911, p. 29.
5. Smith, H. M.: Monograph, Indoor Humidity, 1908.
6. Heymann, B.: Zeitsch. f. Hyg. u. Infectionkr., Leip. 1905, Bnd. 49, 389.
7. J. R. Allen: Notes on Heating and Ventilation, 1911.
8. Goldsbury, P. W.: Boston Med. and Surg. Jr., vol. 165, p. 367.
9. Ercklentz, W.: Zeitsch. f. Hyg. u. Infectionkr., Leip. 1905. Bd. 49, 433.
10. Howland and Hoobler: The Effect of Cold Fresh Air on the Blood Pressure in Pneumonia of Children, Am. Jr. Diseases of Children, vol. 3, pp. 294–303.
11. Peters, L. S.: Archives Internal Medicine, Aug. 1908.
12. Eminet, P. P.: Archiv. f. Kinderheilkunde, Bd. 46, Nos. 3–6, pp. 161–484.
13. Snow, W. G.: Ventilation of Buildings, 1906, p. 24.
14. Starling: Journal Physiology, Feby. 17, 1912.
15. Pomeroy, B. P.: Interstate Med. Journal, vol. 18, 1911, p. 731.
16. Gardiner and Hoagland: Trans. Am. Climatological Assn., vol. 21, 1905.
17. Schneider and Hedblom: Am. Jr. Physiology, Nov. 1908.
18. Collis and Pembrey: Jour. of Physiology, vol. 43, Nov. 20th, 1911.

THE ROUTINE DISINFECTION OF SCHOOLS.

J. T. Ainslie Walker, F. R. M. S., F. C. S., New York City.

Among the numerous problems confronting educationists none, perhaps, is more insistent or more difficult of solution than that of the prevention of infectious disease. Viewed from any standpoint—hygienic, educational, or financial—school epidemics are deplorable; yet, as is evidenced by reports from all parts of the country of the closure of schools owing to infectious outbreaks among the scholars, all the remedies and all the palliatives hitherto brought to bear against them have done little more than touch the fringe of the evil.

The most common school diseases are measles, diphtheria, scarlet fever, and whooping cough, while the available data tend to show that tuberculosis may exist among school children to a much greater extent than is commonly believed. The facts that the first four of these diseases are generally infectious before they can be diagnosed, and that both scarlet fever and diphtheria remain so after the patient has apparently recovered, greatly increase the difficulty of preventing outbreaks among school children and of confining within moderate limits such outbreaks when they have occurred. Pathologists are agreed that each of these diseases is caused by a specific germ. The diphtheria bacillus and the tubercle bacillus have been isolated, studied, and definitely referred to their respective diseases. Although the bacteriology of scarlet fever, measles, and whooping cough has not yet disclosed the complete life history of their specific organisms, the analogies between the various stages of these maladies and the corresponding stages of those in which the specific organism has been identified are so complete that we are justified in assuming that the causal agent in each case is a micro-organism. If this be so, it will be admitted on all hands that the one intelligent method of preventing these diseases is the timely destruction of the causal agent. I would go even further and say that in all cases in which the specific germ has not yet been isolated, but in which various pus cocci appear as the causes of purulent affections of throat, nose, and ear in sequelæ of measles, scarlet fever, etc., the destruction of these germs should be carefully secured.

In the course of his evidence before the consultative committee, upon the school attendance of children below the age of 5, Dr. Newsholme, medical officer to the English Local Government Board, said:

> Infectious diseases are caught in the streets only with great difficulty, and this may be described as retail infection, as against the wholesale infection of the schools.[1]

Sir Shirley Murphy, medical officer to the London County Council, in a paper communicated to the Second International Congress on

School Hygiene, points out that school attendance concerns the general health, for it means an increase of infectious disease.[2] Dr. Henry Kenwood, Chadwick professor of hygiene in the University of London, in a paper on the "Disinfection of school premises,"[3] says:

The statistical evidence in support of school attendance being responsible for the spread of infection is overwhelming. The incidence of most of the infectious diseases is upon those of school age; school children therefore represent the most inflammable material in the community upon which the spark of infection may alight. If, then, we collect and concentrate that material day by day within the narrow compass of school premises, the risks of the spread of infection must be at a maximum on such premises. It must also be admitted that the condition of overcrowding, which demonstrably favors the spread of disease in the general community, comes into operation in an exaggerated form in our classrooms. The above circumstances must combine to make such school classrooms exceptionally favorable centers for the transmission of disease.

In this connection the following extracts from a paper entitled the "Control of certain infectious diseases amongst school children," by Dr. Leslie Kingsford, school medical officer of Liverpool, published in the Medical Officer of May 25, 1912, will be read with interest:

Inquiries made during the years 1900 and 1910 elicited the somewhat surprising information that in only 1.5 per cent of the school cases was there a history of a recent previous case in the house. Consequently, where there is a susceptible school child in the family, it is found in practically every instance that this child is the first to contract the disease and is the one chiefly responsible for handing it on to the younger members of the family who do not attend school. * * * The investigation into the cases of whooping cough occurring during 1910 showed that previous cases at the homes were discovered in only 27 instances, or 0.8 per cent of all the cases, so that in this disease, also, home infection is of little account with respect to the infection of school children.

The case for routine disinfection is clearly and succinctly stated by Prof. Kenwood in the paper referred to above. He says:

No one who is conversant with all the facts will dispute the contention that the periodical disinfection of school premises is an important branch of school hygiene which is often culpably neglected. A systematic disinfection of school premises is, with rare exceptions, performed only as a consequence of the epidemic prevalence of infectious disease among the scholars, and even then the methods adopted are not always those which the more recent scientific work has demonstrated to be the most effective. Yet the facts which indicate the necessity for this precaution, as a routine practice, are of a very striking and convincing nature. * * * Missed early or mild cases spread much infection in school classrooms; and frequent disinfection is an easily practicable means of reducing their potency for evil.

In addition to these mild cases of infection there may be "carrier cases," namely, children who are passive carriers of infection while not themselves affected in any way by the germs they harbor in their throats or in their noses, etc. In some school outbreaks of diphtheria the "carrier cases" in a class from which several sufferers have previously been removed have been found to be far more numerous than the actual sufferers; but while in good health and

fully capable of benefiting from schooling, they may disseminate virulent germs upon the other scholars and the desks, floors, books, etc., of the classroom when they cough, sneeze, recite, or sing. Flügge and others have demonstrated that the germs may thus be sprayed into the atmosphere for several feet from the individual. The infection of scarlet fever, diphtheria, measles and whooping cough from such insidious sources, remaining unrecognized in periods when the class attendance is good, may light up a considerable measure of school infection. But the plea for routine disinfection of school premises does not end with the case in reference to common infectious diseases; there are cogent grounds for adopting the practice as a serviceable precaution against the spread of consumption and certain disease-producing organisms on skin, hair, and clothes, which are known sometimes to constitute a part of classroom dirt and dust. * * * It is indeed surprising that so little should be done in the face of the recognized frequency of classroom infection and the consequent epidemic prevalence of disease, and in the face of the evidence that is gradually accumulating of the valuable results accruing from the frequent disinfection of school premises.

The Scotch Education Department, in a memoradum entitled, "The cleansing and disinfecting of schools," has expressed its views as follows:

The "close smell" so familiar in the schoolroom is due partly to the subtle organic impurities of the air breathed out by the children, partly to the decomposition of organic dirt on the children's bodies or in the room. Such decomposition is normally caused by microbes. Hence, to cleanse a schoolroom properly, it is necessary to destroy the germ life, as well as to remove the visible dirt. This is why periodic disinfection is advisable, *even when no known infectious disease has been present.*

To multiply opinions in support of systematic disinfection of schoolroom floors, would be an easy matter, but it is unnecessary.

We are probably all agreed as to the presence in most schools of a certain proportion of children in the infectious stages of one or other of the diseases already mentioned. Such children can not fail to diffuse infectious material: and that that material, if allowed to accumulate on the floors, to become mingled with the dust, and to be inhaled by the children, must give rise to fresh cases of the disease, is a proposition which should be evident to all unbiased minds.

Let it be granted that the major part of school infection is due to direct contact; there still remains that proportion which is due to the inhalation of bacilliferous dust. Under existing conditions it is impossible to avoid infection by the former means; it is, however, quite possible to avoid infection by the latter. This is why the systematic disinfection of schoolroom floors should be regarded as an important item in every system of school hygiene.

Acceptance of this argument leads naturally to consideration of the method of disinfection to be employed. This, I am strongly of opinion, should take the form of the liquid spray, which is preferable to gaseous disinfection for two reasons: (1) Because the liquid disinfectant insures actual contact with the infected matter, and (2)

because the liquid disinfectant tends to prevent dust—the common vehicle of infection—from rising into the air. In the words of Dr. Leslie Mackenzie, medical officer to the Local Government Board for Scotland:

> Formerly, when infectious disease broke out in a school, a pound or two of sulphur was burned in a basin standing in water, the windows, chimney, and other crevices having been first stuffed up. The place remained closed for a day or two, and was then supposed to be disinfected. This primitive method is still followed in many places, and probably it still satisfies many people. I prefer the simpler, quicker, and more effective method of spraying the walls, floors, desks, and furnishings with a spray pump. This is the quickest method of laying the dust, and I know of no better preliminary to effective cleansing.

It is unnecessary to point out that unless the disinfectant employed be efficient, routine disinfection can be nothing more than a waste of time and money. Aerial disinfection, or fumigation, is still used in some places in this country, in spite of the fact that it has been repeatedly condemned by international congresses and scientific workers generally. Modern research has demonstrated that a better control can be obtained by more direct measures against the organisms of disease and the envelope of dirt by which they are habitually surrounded and conveyed, and this is why the liquid spray is now most generally employed.

To avoid the objectionable odor inseparable from the use of certain disinfectants of low efficiency, necessitating proportionately low dilutions, I would advocate the use of one of the modern high testing disinfectants in a dilution equivalent to at least 1 part pure carbolic acid in 25 parts of water—say one with a Rideal-Walker coefficient of 20, the dilution of which, equivalent to 1:25 carbolic acid, would be 1:500. Taking the cost of such a preparation at $1.50 per gallon, a superficial area of 10,000 square feet could be disinfected daily, for a week, at a cost of approximately 40 cents.

When school is over for the day, the floor of each classroom should be moistened with the above solution by means of an ordinary sprinkling can fitted with a fine rose, and swept in the usual manner while still damp. The desks and seats should be dusted with a cloth sprinkled with the same solution. Dry dusting and sweeping should on no account be permitted; they merely displace the bacilliferous dust, which, after floating in the air for a time, settles again on the floors and desks. Once a week the walls, to a height of 6 or 7 feet from the ground, should be moistened with the same preparation by means of a spraying machine; seats, desks, hat and clothes pegs should be treated in the same manner, particular attention being paid to the last named, while care should also be taken that the tops of the cupboards and other inaccessible places where dust may collect are thoroughly wetted with the solution. Every quarter the spraying op-

erations should be extended to include all parts of the walls and ceiling.

The routine disinfection of schools, as a systematic preventive measure, was first seriously considered in Great Britain in 1907. In his presidential address at that year's congress of the British Medical Association, Dr. Henry Davey said, in reference to tuberculosis, "the only way actually to prevent the disease is by a perfect system of school hygiene, physical and mental, and by a careful system of disinfection and sanitation." But what probably did more than anything else to secure adherents to the process was the issue, by the Scotch Education Department, of the memorandum to which allusion has already been made. During the four and a half years which have elapsed since that time routine disinfection has been adopted by hundreds of education authorities.

If further argument in favor of routine school disinfection be required, it may be found in the fact that the evil effects of breathing bacilliferous dust can not be gauged solely by actual absence through illness. Many of the minor ailments so contracted may be too mild to warrant absence from school or to call for immediate treatment, while being serious enough to lower the vitality of the child to such an extent as to affect its receptive capacity during school hours. Children are legally enforced to attend school, and it surely follows that they should be allowed to do so without encountering any danger which is avoidable by ordinary measures of human precaution.

The position may be summarized as follows: The presence of a certain proportion of infectious children is admittedly unavoidable. These infectious children must diffuse a certain amount of infective material, the removal of which by means of frequent and thorough washing of classrooms and cloakrooms is, on the ground of expense, impossible, or is at least so regarded by the education authorities; the daily sprinkling of the floors with a disinfectant solution offers an inexpensive and easy method of minimizing the harmful effects of that material during the intervals between cleansing. Viewed in this light—*not as a panacea or as a substitute for cleansing*—it is difficult to understand why the benefits to be derived from this process should not appeal more generally to those responsible for the management of our public schools.

[1] Report of committee, page 78.
[2] Lancet, Aug. 10, 1907, p. 406.
[3] The School World, September, 1908.

DISCUSSION.

WILLIAM ESTABROOK CHANCELLOR: One schoolhouse with 900 children had 325 pupils with throat, nose, and similar diseases—diphtheria, sore throat, colds, etc.—all save two in the second and third

floors. By means of certain disinfection methods, including clean shoes, hands, hair, etc., the infection was kept from spreading upon the first floor, and nothing of that kind has ever occurred since. We use formaldehyde in all the ways suggested, spraying at least once and often twice a day. We have also oiled the floors once or twice a year, and air the rooms thoroughly after each disinfection. Our costs have been about $10 a room per year. We must keep infection out and kill it when we find or suspect it.

Dr. THOMAS F. HARRINGTON, Boston, Mass.: Physicians and public-health officials have grown quite skeptical about the value and the efficiency of room disinfection by chemical agents. There are no fixed authentic standards. The daily disinfection of classrooms is not practicable. Few municipalities could carry it out effectively. There is, however, one method that commends itself; namely, the repeated and thorough flushing of each classroom with fresh air by means of open windows and doors. In Boston the rules of the school committee provide that this be done each session between the opening session and recess; during the recess and physical education period, at the close of each session; and at the close of evening school session. There has been less absence among teachers and pupils, and epidemics of communicable diseases have disappeared since the adoption of this plan. We oil the school floors. Recent investigations do not support the belief that the schools are foci of infection. I have never known an outbreak of a communicable disease among school children that was not associated with an outbreak of the same disease in the neighborhood, and easily traceable to some home or church sociable or gathering of children occurring prior to the school outbreak. Furthermore, the daily returns for 25 years at the office of the Boston Board of Health show that the incidence curve of diphtheria and scarlet fever falls three weeks before the closing of school time in June, and rises three weeks before the opening of the fall term—September. If known cases of contagion could be controlled in the homes, and "carriers" excluded from school, the danger of contagion would be reduced to a minimum.

Dr. J. N. HURTY: The chief value of aerial disinfection lies in the fact that it is followed by thorough ventilation to get rid of the smell. Surface disinfection is the cleansing of surfaces by washing and wiping afterward with an approved disinfectant. Necessity of disinfection will be lessened by attention to oral hygiene. The infections of diphtheria, scarlet fever, measles, poliomyelitis, and quite all of the school epidemic diseases, proceeds from the oral and nasal cavities. Keep these cavities as clean as possible by all rational means, and school epidemics will be enormously lessened.

Dr. BOYD W. KNIGHT, New York: I have been much impressed for some years by Dr. Walker's work along this line in England

and in India. I do not consider that sunlight only can be relied on to disinfect school rooms, and strongly urge, therefore, that a standard be adopted which will enable the proper officials to select the most meritorious disinfectant, thus eliminating the danger attendant upon the use of much advertised, but worthless, products; namely, a false sense of safety after such have been used.

Mr. H. O. Way, Cleveland, Ohio: In Cleveland we have been using formaldehyde for school fumigation. We have demonstrated, from our own experiments, that moisture is the condition most essential for success. If the object to be disinfected is moist the amount of formaldehyde usually recommended will be effective in one hour; but if it is dry an exposure of one week will be inefficient.

I am in accord with the views held by Dr. Chapin, of Providence, that disinfection is useless unless preceded by a removal of bacillus carriers. It seems useless to go to the expense of disinfection, only to have the room reinfected by a bacillus carrier.

Dr. Ainslie Walker: I may say that oil treatment of schoolroom floors has been tried in England repeatedly, but always without success. When applied every other week, it was found to harbor dirt and accumulate infective material, and when applied at longer intervals the effect produced was inappreciable, owing to the oil being absorbed by the fiber of the wood. I know of no oil available for this purpose having any bactericidal efficiency. A 2 per cent solution of formalin, in my opinion, is of little value. The carbolic coefficient of formalin is 0.3. The dilution necessary to produce a bactericidal solution equal to 1:25 carbolic (the standard strength employed in hospital work) is therefore 1 part formalin to 7 parts of water—a dilution which is found to be impracticable, owing to the suffocating nature of the gas. As regards fumigation with formaldehyde gas, expert opinion differs widely as to the value of this process. The marked discrepancies in results obtained, even in laboratory experiments, where the various factors are more or less under control, have been pointed out on many occasions. In practice, where these factors can not be controlled, the discrepancies are even more pronounced. For this reason, disinfection by means of formaldehyde vapor can not be recommended for general use. Dry formaldehyde gas has no value at all, hence the introduction of steam to provide the necessary moisture for producing the solution of formaldehyde, without which there is no action. The difficulty in producing a solution of the required strength by this means will be apparent. No difficulty is experienced, on the other hand, where the disinfectant spray is employed. Mention was also made of the use of sulphur in fumigation. Of this product, I would only say that it has been repeatedly condemned by international congresses during the past 20 years. The British Medical Journal of November 3, 1894, refers to its use in the following terms: "On the ground even of economy

there is no comparison between this obsolete process and the disinfectant spray." As regards Dr. Hurty's plea for fresh air and oral hygiene, in suggesting routine disinfection of classroom floors, I am assuming, of course, that both have had proper attention. No amount of fresh air alone, however, can destroy the infective material to be found on the average schoolroom floor. I was much interested in Dr. Chancellor's description of the method employed by him in dealing with the septic sore throat outbreak. I fear, however, that the cost (quite apart from the question of efficiency) would make it prohibitive. In reply to Dr. Woods, I should like to say that, although I have no figures before me at the moment, an experiment extending over a year was carried out by the Buckinghamshire Education Committee, with the view of obtaining the data for which Dr. Woods asks. This consisted in comparing the attendances at two groups, each consisting of 24 schools, of which one group had been disinfected daily, and the other not at all. The result showed an appreciable decrease in the percentage of children absent, through sickness, from the disinfected schools, the increase in the Government grant earned (through the better attendance) being sufficient to pay for the cost of disinfection and to leave a balance in hand. For the actual figures, I must refer Dr. Woods to the Annual Report of the Buckinghamshire Education Committee for 1909.

TUESDAY AFTERNOON, SEPTEMBER 24, 1912.

THE REDUCTION OF INFANT MORTALITY IN NEW YORK CITY.

S. Josephine Baker, M. D., Director of Child Hygiene, Department of Health, New York City.

In the reduction of the death rate in any age group, or even from any specific cause, there is often danger in placing too great emphasis upon methods in their relation to results. This dictum may be considered as particularly true with reference to infant mortality.

General improved sanitation and hygiene have shown their effects in regard to the lowering of the death rate of infants under 1 year of age, in much the same ratio that has obtained in the lowering of the general death rate as it pertains to the class of cases that might reasonably be affected by such an influence.

A marked increase or decrease in the infant death rate during a short period of time may also be misleading. Incidents are not wanting where congratulations on a lowered death rate have been followed by a feeling of despondency when, with apparently the same conditions and methods, the death rate has again assumed an upward tendency.

A marked instance of such a transitory reduction was noted in New York City in 1903. In that year there was a numerical decrease of 1,112 deaths under 1 year of age. The following year there was a numerical increase of 1,712 deaths for the same age period. This increase persisted with a less degree of intensity until 1908, when the division of child hygiene was organized, and the department's efforts were broadly developed along preventive lines.

In general, in New York City, the decline of the infant mortality rate has been regular during the past three decades. During the 30-year period from 1880 to 1910 the rate declined from 288.9 to 133.9 per thousand infants living under 1 year of age.

Considering the causes of death, as grouped in four general classes, a reduction of 70 per cent was shown in the contagious diseases, 37 per cent in the diarrheal diseases, 38 per cent in the respiratory diseases, and 4 per cent in the group known as congenital diseases, including marasmus. During the period of time between 1876 and 1908 the Department of Health of New York City dealt directly with the situation in the summer months only by detailing physicians

to treat sick babies, by lectures to mothers on baby care, and by the distribution of educational printed matter on the same topic.

These efforts were supplemented by various private charitable organizations, but it would be difficult to determine if this work had any extensive or direct result in life-saving, except as a part of a general improvement in sanitary methods.

The Department of Health of New York City states as a fundamental precept that "public health is purchasable; within natural limitations a community can determine its own death rate." Communities have been slow to recognize this truth, but that there is a rapidly growing recognition is known to any student of civic sentiment. In the United States the increase in interest in matters pertaining to child welfare has been marked in the past five years. Possibly in no other line of public-health work has such an advance in interest been made, and of the various efforts made to conserve the health of children "baby saving" has made the most direct public appeal. The most impressive and significant impression made by attending a meeting of our national "Association for the Study and Prevention of Infant Mortality" is the various classes of people represented—physicians and trained nurses, teachers and students, social workers, philanthropists, clergymen, clubwomen, Government officials, and laymen, meeting on the common ground of that great human appeal—life-saving. It is this awakening of the public mind, this catholic interest, that causes even the most crowded of newspapers to print infant-mortality statistics as "news," and the magazines to publish leading articles on baby-saving campaigns, that has made possible the "purchasing of public health," and the saving of thousands of otherwise doomed babies.

While this movement has been felt in all civilized countries, it has expressed itself in such a concrete form in New York City that the methods used and the results achieved are in themselves the excuse for confining the consideration of this complex problem to a purely local aspect.

The specific interest in the welfare of children to be considered as an age group was crystallized in the summer of 1908 by the formation of the division of child hygiene of the department of health to control all public health matters affecting children from birth to puberty. The reduction of infant mortality forms one of the most important duties of the division. In order to judge the value of the methods employed, a study of the infant death rate for the past 10 years is of interest.

In 1902, this death rate was 168 per 1,000; in 1907, it was 160; the intervening years showed slight variations. In 1908, with the generous appropriation for the division, it was possible to begin the plan

of preventive work in baby saving which has since been broadly elaborated. The first year's work showed a death rate of 144 per 1,000, a reduction of 16 points. During that and the succeeding two years, it was possible to carry on the work from May to the middle of September. The members of the board of estimate, New York City's money-appropriating power, were not yet sufficiently impressed by the need of an all-year-round campaign, although the department urged its necessity. During 1909 and 1910, a further reduction of 10 points was made in the death rate. In the latter year, a child-welfare exhibit brought the matter fairly to the attention of the public, and for 1911 an appropriation was made sufficient to allow the establishment of 15 infants' milk stations, to be maintained throughout the year. Early in the spring of the same year, the New York Milk Committee, a private organization, formed to forward civic interests along its specified lines, and, in a spirited campaign led by Mrs. J. Borden Harriman, raised sufficient funds by private contribution to open 31 infants' milk stations to work in cooperation with the department of health and demonstrate the value of this method of reducing infant mortality, the avowed intention being to maintain the stations until the city would provide for their support. These stations, together with those of the department of health, the New York Diet Kitchen Association, Nathan Straus, the Brooklyn Children's Aid Society, Babies' Dairies, Morningside Milk Dispensary and Nurses' Settlement, gave a total of 79 stations for the city. These were soon combined in an Association of Infants' Milk Stations, with uniform methods of record keeping, reporting to a central office, and full cooperation, with elimination of duplication of effort.

The division of child hygiene, supplementing and cooperating with the stations, had 157 trained nurses making home visits to babies out of reach of the stations. Each nurse was furnished, from the birth records of the department, with the names and addresses of 150 babies in the poorer congested quarters of the city. The names were transmitted to the nurse daily, immediately upon receipt of the notification of the birth, until the full quota had been assigned. Each nurse was wholly responsible for the babies under her control from May 1 to September 15. With 16,987 babies under the care of the district nurses, and 11,644 under the supervision of the stations, a total of 28,631 babies were under direct control.

A campaign of wide publicity was carried on through the newspapers. Printed educational matter was freely distributed, lectures delivered to mothers, at weekly intervals, at over 100 suitable places throughout the city, and the aid of over 20,000 girls from 12 to 14 years of age was enlisted and made of practical value by the formation of "little mothers' leagues."

These leagues are still one of the most important branches of our work. The girls are taught all practical methods of baby hygiene and feeding. The potential value of training young girls for intelligent motherhood is not only of immense importance, but the immediate results have been striking in the improved care that is given to the babies who are directly under the care of these young girls. As true preventive work, it ranks of first importance in the prevention of infant mortality in this and the next generation. In all, 239 of these leagues were formed in 1911, and practically an equal number have been organized this year. Weekly meetings are held for instruction. Each league is under the supervision of a doctor and a nurse from the division of child hygiene.

Weather conditions during the summer of 1911 were unfavorable. The intensity and continuous duration of the heat were more marked than that recorded for any summer since 1901. At the end of the year there were recorded 1,182 fewer deaths under 1 year of age than for the previous year. This reduction took place between the dates of June 15 and September 15, and of the total reduction 954 represented the decrease in deaths from diarrheal diseases, the class of cases against which practically the whole force of the movement had been exerted.

The experiment was carefully followed by public-spirited citizens. The board of estimate, composed of men keenly alive to and in sympathy with movements tending toward increased efficiency in civic welfare, appropriated for use in 1912 sufficient funds to establish 40 additional infants' milk stations, giving a total of 55 under the control of the division of child hygiene of the department of health. The intelligent generosity of the city government exemplified the truism that "public health is purchasable," with the recognition that infant mortality is a public-health problem, and that it is the duty as well as the privilege of the government to assume, in a broad sense, the responsibility of this most important sanitary problem. Enough additional money was appropriated to increase the staff of nurses, so that increased registration at the milk stations might be adequately handled. The force of district nurses was also augmented.

At present one nurse and an assistant are assigned to each station during the entire year, with an additional nurse and assistant from May 1 to October 1, leaving a total of 200 nurses, including a supervising force, available for district visiting in the care of babies for the summer months. One physician is detailed to each three stations, except during the summer, when each station has the continuous service of one physician. In all, 130 physicians are employed for station assignments and for supervisory work in cooperation with the nurses in caring for delicate or ill babies in their homes.

While the reduction in the infant death rate for 1911 had been extremely gratifying, it was evident, from an analysis of the statistics of former years, that definite conclusions as to the actual value of the methods employed could not be accepted without qualification when based upon the results of one year's activity. The year 1912 was therefore viewed with some trepidation. The New York Milk Committee and the Brooklyn Children's Aid Society, feeling that they had demonstrated the value of infants' milk stations in baby saving, and with the conviction that the municipality should assume full responsibility for the infant-mortality problem, withdrew from the field, thus closing 38 stations, the 40 new ones opened by the city giving a net gain of only two to not only hold the gain in the reduction in the death rate, but, if possible, to make this gain greater.

The grouping of the infants' milk stations in an association served to emphasize the need of still stronger cooperation among the various agencies in the city whose activities brought them into more or less direct contact with infant-welfare work. There are approximately 150 such agencies in New York City, and they have heretofore worked for the greater part quite independently of each other. Duplication of effort in many lines has been encountered, with a resulting great loss in efficiency.

Early this year the executive committee of the Infants' Milk Station Association invited all of the agencies to federate under the title of the Babies' Welfare Association. The response was immediate and enthusiastic. A central office, with an executive secretary, was established at the department of health. An executive committee was formed, with one member to represent each class of interests. Subcommittees were formed, with a membership including representatives from all organizations in the city dealing with the particular form of baby-welfare work of the special committee.

The subcommittee on milk stations has as its province the study of the present stations for the purpose of producing more complete cooperation among the various organizations, widening the influence of the stations, and broadening their work of relief. It has divided the city into milk-station districts, assigning one district to each station, so that the old trouble of overlapping and proselyting between milk-station organizations has been practically eliminated. At the same time these districts are to be used as a basis for recommendations as to the establishment of new milk stations. This committee is also cooperating with the committee on hospitals in working out a uniform policy governing the treatment of sick cases at the milk stations and with the committee on social service in solving relief problems. The committee is endeavoring, as far as possible, to establish uniformity of method in the stations of the various organizations

and to bring about closer relations between the stations and other agencies.

The subcommittee on hospitals and dispensaries has established a central bureau to furnish daily information regarding available facilities in hospitals, dispensaries, and nurseries and to act as an agent in placing babies referred to it by any agency in the field. Reports have been received and tabulated from nearly 50 hospitals handling baby cases, showing how many beds are available in each institution and what the conditions are for admission. Hospital cases at the milk stations are referred directly to the executive secretary at the central office. He has merely to refer to his records to locate the nearest hospital which is likely to have an available bed on that particular day and without loss of time makes arrangements for receiving a baby. Under the old individual system it often took a nurse at a milk station several hours, and sometimes days, to find accommodations for a little patient.

The outing agencies of the city have been similarly treated. Whenever a worker comes across a baby under two years of age needing a fresh-air outing the central office of the Babies' Welfare Association is notified and arrangements are made for receiving the child. This branch of the work is under the direction of the subcommittee on outings. This committee is also considering the problem of establishing playgrounds for little mothers in vacant building lots. It has also taken up the question of establishing temporary shelter for well babies during the sickness of their mothers.

The committee on social service has accomplished an excellent piece of work in solving the problem of emergency milk relief. Hitherto, when a baby suffering from digestive trouble needed pure milk for which it parents could not pay, it has been necessary to report the case in writing to one of the relief societies and await their investigation, which often took a day or more. In the meantime, the baby might need that milk immediately to save its life. That meant that the cost must come out of the nurse's own pocket if the milk were supplied. An arrangement was made with the relief societies this summer whereby a nurse discovering a baby in need of emergency milk relief can call up a relief agency on the telephone, state such facts about the case as she has at hand and, within 15 minutes' time, receive, also by telephone, from the relief agency, a report as to whether it considers the case likely to prove worthy of charity after further investigation. In that case the relief society will pay the cost of supplying the milk while it carries on its investigation in detail. Under this system no worthy relief case is required to suffer from delay, and no nurse is required to take the price of the milk out of her scanty earnings. The distribution of free ice has also been greatly facilitated by this committee. Hitherto free tickets

meant for needy families with sick children had been distributed to half a dozen agencies. As many different sets of tickets had to be printed. Now one set of these tickets is sent out by the association to the entire field.

The committee on publicity and statistics acts as a clearing house of information between the members of the association, the beneficiaries, and the public regarding all details of the work of the association. Weekly reports are received at the central office from the milk stations. The central office in turn sends out a weekly statement of mortality records and facts regarding the progress of the work. The substance of these reports is condensed in weekly or semiweekly newspaper stories. Special articles regarding the work have been printed in the Sunday newspapers and magazines. Queries are received constantly from other cities. Perhaps the most important feature of this committee's work is its educational publicity. Leaflets and folders, put in simple language and sometimes translated into Italian and Yiddish, giving information about various phases of the care of babies, have been distributed by the hundreds of thousands through the tenement sections. Pocket cards giving the location of the milk stations have been given to every available person in the city who is in a position to direct needy mothers to the milk stations. Every policeman and park department employee in the tenement sections has one of these cards in his pocket. A series of 12 articles on baby care have been prepared at the request of the committee and printed in the English, Italian, and Yiddish newspapers which have large circulation in the tenement districts.

There is also a subcommittee on central office, which looks after the needs of the central organization, and makes such provision as becomes necessary from time to time for carrying on the work. So far there has been very little need of a treasurer or common fund. The services of an executive secretary have been provided by the New York Milk Committee, and the Russell Sage Foundation has contributed the time of an investigator, who has done some valuable field work for the association this summer. One secret of the success of the association has been the fact that no new appealing body has been thrust into the field. It is the general opinion that the plan is a success, and there seems to be no longer a doubt but that the organization will be a permanent one. Cooperation without amalgamation has been brought about by the association. No organization within it in any way loses its individuality or has its methods of work encroached upon.

With this impetus and cooperation, the work has been carried on by the division of child hygiene substantially along the lines followed in 1911.

At the present time it is estimated that of the 135,000 babies in New York City, 50,000 have mothers who are ignorant of the simplest methods of proper baby care, and who are unable to pay for such advice or for medical treatment in case of illness.

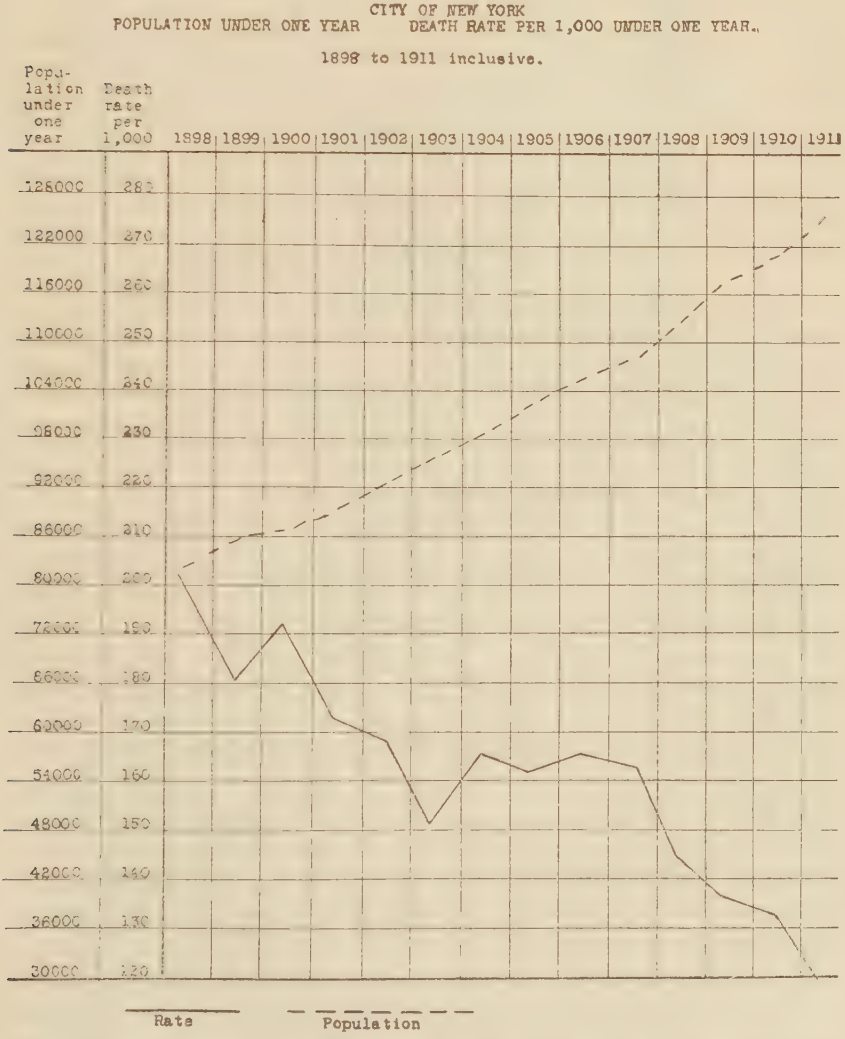
The division of child hygiene has approximately 34,000 of these babies under its control; the allied agencies are caring for about 10,000 of the remainder, leaving an estimated number of 6,000 not yet reached. From January 1 to September 1, 1912, there have been 576 fewer deaths under 1 year from all causes than for the same period of 1911. Four hundred and seventeen of this number represent the decrease in deaths from diarrheal diseases.

Possibly a more graphic method of showing the results of systematic widespread work along preventive lines may be shown by a further study of the mortality statistics. For the four-year period previous to the organization of the division of child hygiene and the assumption by it of the responsibility for the reduction of infant mortality the infant death rate each year showed a numerical increase amounting to a total of 3,026 deaths, while, for the four years since the division was organized, there has been an actual numerical decrease of 2,407 deaths. The death rate for the first-year period, from 1904 to 1907, inclusive, ranged from a maximum of 164 to a minimum of 160 per 1,000. From 1908 to 1911, inclusive, the maximum rate was 144 in 1908, and the minimum was 120 in 1911. In the division's four years of work, this rate has dropped from 160 to 120 per 1,000 deaths from all causes, while the diarrheal death rate has declined from 48.90 to 30.70 in the same period of time.

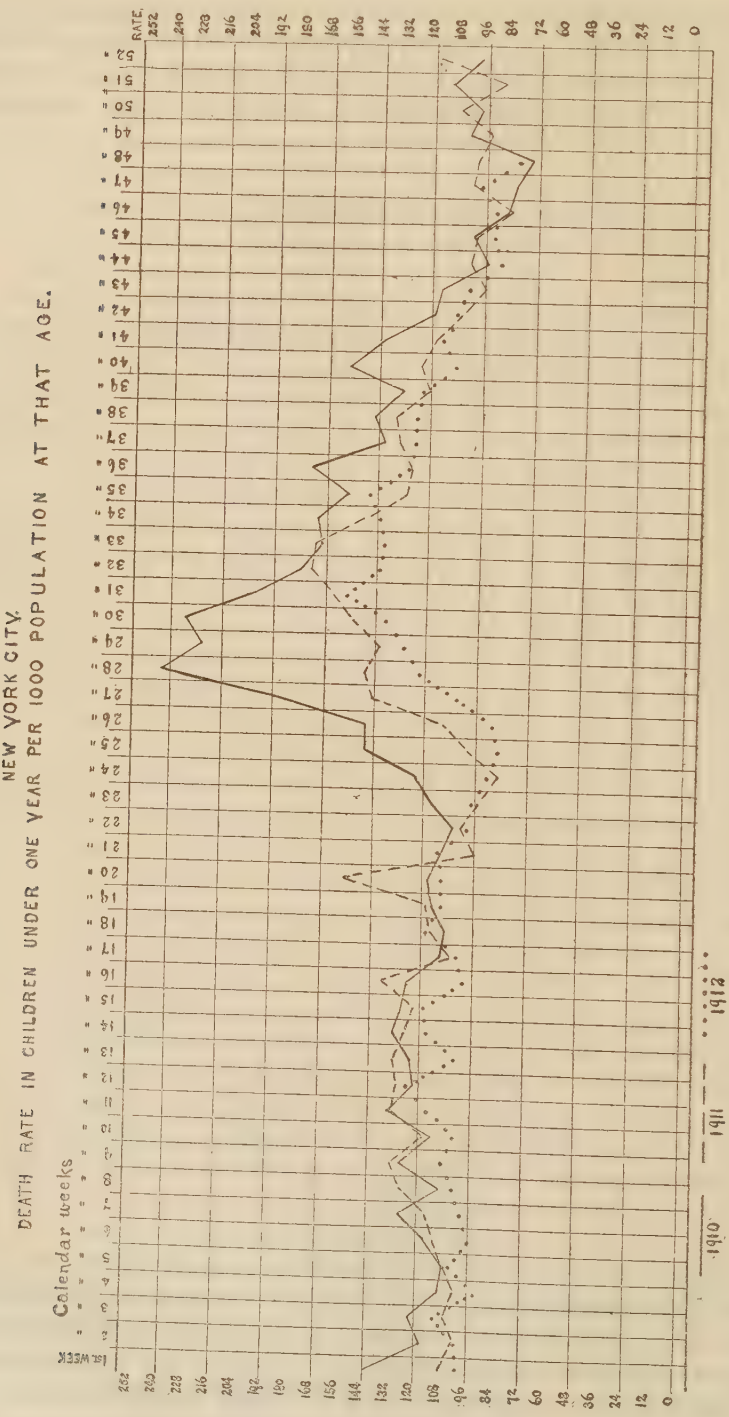
While these results have justified our expectations, we are keenly alive to the importance of further efforts along other lines. The two most important problems to be solved at present are the reduction of infant mortality from so-called "congenital causes" and among institution babies.

In New York City approximately 35 per cent of the deaths under 1 year of age are due to causes mainly dependent upon the health of the mother during her pregnancy and confinement; 32 per cent of the deaths under 1 year occur in the first month of life and 54 per cent in the first three months. This problem is so complex that, even with the most strenuous efforts to solve it, brilliant results can not be expected within the near future. The infants' milk stations, serving as educational centers, are capable of valuable aid. Early registration of pregnant women and continuous supervision following the lines already laid down by various private organizations will show beneficial results, but our whole economic and social structure must be readjusted for ultimate and permanent success. The wide difference between dealing with a few selected cases by a compact private organization, and grappling with the whole situation in a large city

by Government action, is obvious; but we intend to vigorously follow up this line of work. These babies suffering from congenital debility furnish the greater number of victims in the annual summer increase in the death rate. They furnish at present the most important factor in the total infant mortality.



However difficult this class of cases may be to deal with, the death rate in institutions for infants is of equal complexity, though seemingly much more simple. The well-known high death rate among illegitimate babies is in part responsible for the appalling statistics furnished by the foundling asylums. These asylums furnish the greater proportion of the infant mortality in institutions of all


NEW YORK CITY.
DEATH RATE IN CHILDREN UNDER ONE YEAR PER 1000 POPULATION AT THAT AGE.
Calendar weeks
1910
1911
1912

classes, and, in New York, our largest institution of this kind has had a death rate of 50 per cent for the past two years, based on births in the institution and admissions under 1 year of age. Hospitals for sick babies also furnish a mortality which seems excessively high. In 1910 the institution death rate of babies under 1 year of age furnished 42 per cent of the total in the Borough of Manhattan of New York City.

This condition is being met in part by the boarding out of a proportion of the foundling babies in private homes, under the supervision of doctors and nurses of the division of child hygiene. This supervision is neither as far-reaching nor as effective as it should be, owing to the institutional rules; but excellent results have been obtained from even this imperfect system. The attempt to raise babies wholesale is a failure, and individual care for them offers the easiest and quickest method of life saving.

The evolution of the infants' milk stations is essential. Pure milk, however desirable, will never alone solve the infant-mortality problem. Under our system of home visiting to instruct mothers in the care of babies we have demonstrated that babies may be kept under continuous supervision at a cost of 60 cents per month for each baby, and the death rate among babies so cared for by us has been 1.4 per cent. The death rate among the babies under the care of the milk stations has been 2.5 per cent, and the cost $2 per month per baby. Without overlooking the value of pure milk, I believe that this problem must primarily be solved by educational measures. In other words, that the solution of the problem of infant mortality is 20 per cent pure milk and 80 per cent training of the mothers. The infants' milk stations will serve their wider usefulness when they become educational centers for prenatal instruction, the encouragement of breast feeding, and the teaching of baby hygiene. The mother will be instructed to buy the proper grade of milk at the place most convenient to her home.

With these next steps still to be taken New York City has already demonstrated that infant mortality is a public health problem, that it should and can be effectively dealt with by a properly organized department of health, and that money wisely expended buys public health as readily as it does any commodity. In the largest city, with the most complex population in this country, in a city where poverty and congestion of population are exemplified in their worst forms, where immigration furnishes a rushing tide that knows no ebb, and where the resulting economic and social conditions baffle our most advanced students of civic problems, we have demonstrated that the door of hope is open to the littlest of our citizens and that, under the worst conditions, it is possible to solve at least a part of the infant-

mortality problem. Our cities are learning that "it is not the babies that are born but those that are saved that count."

Table showing deaths and death rates of children under 1 year of age, based on the estimated population at that age.

Year.	All causes.		Diarrheal diseases.	
	Deaths.	Rate.	Deaths.	Rate.
1902	15,526	168	4,090	44.28
1903	14,413	151	3,769	39.56
1904	16,125	164	4,726	48.08
1905	16,522	163	4,945	48.75
1906	17,188	164	4,943	47.08
1907	17,437	160	5,314	48.90
1908	16,231	144	5,118	45.45
1909	15,976	137	4,254	36.45
1910	16,212	134	5,807	47.97
1911	15,030	120	3,853	30.70
1912 (to Sept. 1)	9,868	113	2,218	25.47

DISCUSSION.

Miss MINNIE H. AHRENS, superintendent, Infant Welfare Society, Chicago, Ill.: In the year 1910 an average of 2,000 bottles of milk were prepared daily according to standard formulæ. To-day all milk is delivered in the home and the mother is taught to prepare it according to formulæ made out by the physician.

Dr. F. DUFFIELD: We have in Detroit in the summer several very hot days, with a high relative humidity, and then a cool spell. If one watches the death certificates at this time one is struck with the number of deaths due to prematurity. As the weather cools the prematurities lessen.

Again, a large number of death certificates marked "cholera infantum" are found on investigation to be really "infantile atrophies," with an acute diarrhea as the immediate cause of death.

Dr. THOMAS F. HARRINGTON, Boston, Mass.: In a study of infant mortality, carried out for a long series of years in one of the largest cities in this country, I observed that there was a constant ratio between the temperature during May and June to the infant mortality in July, August, and early September. A high general temperature during May and June was followed by a higher infant mortality in the summer months than was evident when May and June were cool, even though the summer months were much warmer than in other years. The reverse was equally evident, i. e., a cool May and June gave a low infant mortality, irrespective of the average temperature during July, August, and September. My contentions are that the resistant force of the infant is destroyed by the warm early months, so that when the warm, humid days of July and August overtake the infant the tide is easily against the infant, hence the high mortality.

G. J. Holmes, Newark, N. J.: I congratulate Dr. Baker on her excellent paper. She did not mention, however, where the stations are located. I would like to urge that the public school building be used, and that these stations be located in such buildings. I know of no better use to which to put a classroom. Public schools should be for the education of adults as well as children. I would suggest that this educational work be made a part of medical inspections of public schools, and that the medical inspectors and school nurse give the instruction. Instruction in baby hygience should be made an important part of the public school course for girls from 12 to 16 years of age. The location of the stations in the public school buildings affords actual living material for instructing the young girls during the course of instruction. Here would be an ocular demonstration from this instruction.

The cost of establishing these stations and maintaining them would be lowered by using public buildings.

We have established, in a public school in the city of Newark, N. J., such a clinic where parents are instructed in the feeding, bathing, clothing, and general care of the babies. Advantage, however, is not taken of this opportunity to instruct the young girls.

L. T. Royster, M. D., Norfolk, Va.: There are, of course, many causes which combine to produce that symptom complex known as summer diarrhea. The studies of Lieffmann and Lindemann, to which allusion has been made, are apparently quite conclusive. I had the pleasure of studying this question during the past year for this country. The paper was read before the American Medical Association at the Atlantic City session. I feel that the mere incidence of heat alone does not produce the trouble, but, rather, a lack of radiation. Therefore, I feel assured that humidity plays its own part in the matter. The German authors already quoted state that a relative humidity of 50 per cent is high. In this country there are few cities which do not average much higher than this. In fact, from 70 to 90 in many instances at the critical period of the year. Those of us who are familiar with conditions on the seashore well know how we can take a child who has had a bad diarrhea the previous day, apparently from the heat, and send that child out on the water, and by night the cheeks will be filled out and the eyes less sunken. This is in spite of the fact that the heat is frequently as great on the water as on land, and the humidity greater, but on the water there is always a breeze, hence the radiation is greater. This is also true in the intensely hot parts of the West. I am told that summer there is the healthiest time of the year for children, with a temperature often above 100° (we could not live at such temperatures on the coast), but at this time the relative humidity is frequently as low as 4 per cent. Hence the radiation is exceptionally great.

Dr. Ira S. Wile, New York, N. Y.: The parental care, as found in the experience of the New York Milk Committee, may reduce the mortality from congenital causes by 50 per cent.

The relation of milk and education at the milk stations represents not alone the 20 per cent and 80 per cent referred to by Dr. Baker, but appears to be that of bait and opportunity. The New York Milk Committee has had centers of hygiene without milk dispensation, and the results have been equal to those gotten at milk stations, as far as the babies are concerned. There was not as large a number of mothers attracted to the educational center without the milk dispensations as with it.

The midwives are a factor in 45 per cent of the births of New York City, and their relation to the subject deserves further study, but a later session will discuss this topic.

The milk stations that dispense milk in bottles according to definite formulæ fail to recognize the educational value of such an institution. The mother must be taught to prepare the food, though offering whole milk makes an attractive bait.

DIE BEKÄMPFUNG DER ANSTECKENDEN KINDERKRANKHEITEN.

Dr. Walther Ewald (Bremerhaven).

Die ansteckenden Krankheiten haben seit einigen Jahrzehnten alle Schrecken verloren, seitdem es gelungen ist, mit den Waffen der Hygiene und der Seuchenbekämpfung ihnen erfolgreich zu begegnen und sie immer mehr zurückzudrängen. Bei einer Krankheit wie den Pocken, die früher in endemischer Verbreitung überall auf der Erde vorkamen, ist es gelungen, ganze Länder seuchenfrei zu halten und sogar die Bevölkerung des Landes wie in Deutschland gegen diese furchtbare Seuche zu immunisieren. Andere Krankheiten, wie Pest und Cholera, deren Nahen früher banges Entsetzen hervorrief, machen an der Grenze der zivilisierten Länder Halt, obwohl sie in Asien und Afrika in derselben Ausdehnung wie früher verbreitet sind, und wenn einmal ein Krankheitsfall eingeschleppt wird, so kann er doch eine Allgemeininfektion nicht bewirken und wird schnell unschädlich gemacht. Wenn wir in allen Kulturländern immer wieder derselben Erscheinung begegnen, dass die Sterblichkeit im Laufe der letzten Jahrzehnte gesunken ist, so müssen wir diese Verlängerung der durchschnittlichen Lebensdauer hauptsächlich darauf zurückführen, dass es gelungen ist, die Infektionskrankheiten mit Erfolg zu bekämpfen, dass die grossen tropischen Seuchen, wie Pest, Cholera, Lepra bei uns keinen Boden mehr finden, und dass die endemischen Seuchen wie Rückfallfieber, Flecktyphus, Typhus und

andere mehr erheblich zurückgedrängt sind und die allgemeine Sterblichkeit daher nicht mehr beeinflussen können.

Eine Ausnahme von dieser Erscheinung findet sich nur bei einer Gruppe von Infektionskrankheiten, die zwar weder klinisch noch durch die Aetiologie zueinander gehören, die aber dadurch miteinander verbunden sind, dass sie hauptsächlich nur das Kindesalter befallen und darum auch zu den typischen Kinderkrankheiten gerechnet werden: es sind hauptsächlich Masern, Scharlach, Keuchhusten und Diphtherie und in geringerer Bedeutung die epidemische Genickstarre, die Kinderlähmung, die Malaria und andere Infektionskrankheiten. Die echten Kinderkrankheiten zeichnen sich dadurch aus, dass sie bei gleich grosser Verbreitungsmöglichkeit ausschliesslich oder hauptsächlich nur Kinder befallen. Es erkranken auffallend viel Kinder, von denen auch eine Anzahl sterben; je älter die Kinder sind, um so weniger zahlreich sind die Erkrankungsfälle. Auch die Erwachsenen sind nicht gegen die Erkrankung gefeit; aber ihre Erkrankungshäufigkeit ist verschwindend gering. Der grossen Erkrankungsziffer besonders der jüngeren Kinder steht häufig eine geringe Letalität gegenüber, während die Letalität der jugendlichen Personen und der Erwachsenen viel grösser ist. Die epidemische spinale Kinderlähmung ist eine echte Kinderkrankheit. In einer Tabelle, in der die bei der grossen Epidemie in Schweden beobachteten Fälle nach der prozentualen Verteilung der Altersklassen dargestellt sind, sind die Krankheitsfälle durch die gezackte, die Todesfälle durch die schwarze Linie gekennzeichnet. Es handelt sich um eine typische Kinderkrankheit; denn hauptsächlich sind es die jüngsten Altersklassen, die von der Krankheit ergriffen werden. Die gezackte Kurve beginnt deshalb ziemlich hoch und fällt schnell ab. Die Mortalitätskurve verläuft gerade umgekehrt, so dass beide Kurven sich scherenförmig kreuzen. Es erkranken viele Kinder, von denen aber nur wenige sterben. Er erkranken wenig Erwachsene, die denn auch häufiger der Krankheit erliegen.

Echte Kinderkrankheiten sind die Diphtherie und der Keuchhusten, die auch bei Erwachsenen vorkommen, aber hauptsächlich die jüngsten Altersklassen befallen. Eine echte Kinderkrankheit ist auch die übertragbare Genickstarre, die zu 75–85 Prozent Kinder unter 15 Jahren befällt.

Nun gibt es aber Infektionskrankheiten, die den Genesenen gegen eine spätere Wiederinfektion immunisieren. Treten solche Krankheiten endemisch auf, so befallen sie nur diejenigen Personen, die noch nicht die Krankheit gehabt haben, und das sind die Kinder. Es erweckt dann den Anschein, als ob eine echte Kinderkrankheit vorliegt. Unter diesem täuschenden Bilde der Kinderkraukheit sind früher die Pocken allegemein aufgetreten. Und auch heute haben wir in den Masern eine derartige Krankheit, die, ohne zu den

echten Kinderkrankheiten zu gehören, doch bei ihrer endemischen Verbreitung ausschliesslich Kinder befällt. Aber wenn einmal die Masern eine bis dahin nicht betroffene Völkerschaft befallen haben, dann sind auch ihre Verheerungen in allen Altersklassen furchtbar gewesen. So wurden ganze Stämme der Eingeborenen an den Ufern des Amazonenstroms 1749 hingerafft und die Zahl der der Seuche Erlegenen wird auf 30,000 veranschlagt. In Astoria fiel 1829 fast die Hälfte der Eingeborenen der Krankheit zum Opfer. Und dasselbe ereignete sich 1846 under den Indianern der Hudson-Bay-Länder, 1852 unter den Hottentotten im Kaplande, 1854 und 1861 unter den Eingeborenen von Tasmania und 1874 auf Mauritius und den Fidschi-Inseln. Man wird schon hieraus entnehmen können, dass diese Krankheit sich in verschiedener Weise von den echten Kinderkrankheiten unterscheiden wird.

Im allegemeinen ist die Anschauung verbreitet, dass die infektiösen Kinderkrankheiten recht harmloser Natur seien und höchstens der Scharlach und die Diphtherie durch heimtückische Komplikationen zahlreichere Opfer fordern. Infolgedessen ist bisher auch nichts in der Bekämpfung der Kinderkrankheiten geschehen ganz im Gegensatz zu den Massnahmen gegen die Infektionskrankheiten, die hauptsächlich die Erwachsenen befallen. Das ist aber eine irrige Meinung. Es starben z. B. in Deutschland im Jahre 1910 an Typhus 2,500 Menschen, an Influenza 7,500 und an allen anderen Infektionskrankheiten zusammen ausser Tuberkulose und Lungenentzündung 11,500 Personen. Dagegen betrug die Sterblichkeit—

An Scharlach	7,000
An Masern und Röteln	11,000
An Keuchhusten	14,000
An Diphtherie	14,500
Zusammen	46,500

Die Kinderkrankheiten fordern also weit mehr Opfer als die anderen Infektionskrankheiten zusammen, und unter ihnen ist nicht etwa der Scharlach am gefährlichsten, wie gewöhnlich angenommen wird, sondern der Keuchhusten und die Diphtherie, und selbst Masern und Röteln fordern mehr Opfer als der so gefährlich erscheinende Scharlach. Im Jahre 1906 und 1908 übertraf übrigens der Keuchhusten mit 18,000 resp. 16,000 Fällen sogar die Diphtherie, während bei den andern Krankheiten zwar auch die Zahlen schwanken, aber dasselbe Verhältnis erhalten bleibt. Jede einzelne der Kinderkrankheiten übertrifft die sonst so gefürchteten Seuchen und selbst die gefährliche Cholera konnte in Deutschland bei ihren beiden letzten Einfällen 1892 und 1905 nur 8573 resp. 88 Todesfälle veranlassen. Die ausserordentliche Verbreitung der infektiösen Kinderkrankheiten ist nun aber nicht etwa nur für Deutschland charackteristisch, sondern trifft überhaupt für Europa und überhaupt wohl

für die ganze zivilisierte Welt zu. Es ist natürlich bedenklich, in den verschiedenen Staaten die Sterblichkeit an den einzelnen Krankheiten in Vergleich zu setzen; denn überall ist die Art der Erhebungen verschieden. Besonders wird aber die Statistik auch dadurch beeinflusst, dass in verschiedenen Ländern Nachkrankheiten verschieden rubriziert werden, so Lungenentzündung nach Masern bald als Lungenentzündung, bald als Masern oder Nierenentzündung bei Scharlach bald als Nierenentzündung, bald als Scharlach. Auch die Verschiedenheit des Kulturzustandes, der Bevölkerungsdichtigkeit, des Vorwiegens der städtischen oder ländlichen Bevölkerung bringt Differenzen mit sich, die die statistische Verleichung erschweren müssen. Wenn man sich jedoch nicht an die absoluten Ziffern hält, sondern nur einen Vergleich dafür haben will, ob denn tatsächlich die infektiösen Kinderkrankheiten überall noch eine so wichtige Rolle spielen, so wird man immerhin mit einiger Reserve eine solche Untersuchung auf die verschiedenen Länder ausdehnen können. Ich bringe nachfolgend eine Tabelle, in der eine Anzahl von Staaten und Städtegruppen Europas auf das Vorhandensein der Kinderkrankheiten verglichen werden. Von je 100.000 Einwohnern starben an folgenden Krankheiten:

	Jahr.	Einwohnerzahl in Tausend.	Scharlach.	Masern und Röteln.	Diphtherie.	Keuchhusten.
Staaten:						
Deutsches Reich	1908	62,112	17.4	17.1	24.0	26.4
Schweiz	1908	3,555	4.1	6.4	15.9	13.8
England und Wales	1909	37,757	9.0	35.4	14.6	20.1
Belgien	1908	7,386	16.3	40.4	16.6	36.2
Niederlande	1909	5,857	3.0	16.6	7.8	17.1
Russland	1909	[1] 64.827	153.4	129.6	89.6	104.9
Städtegruppen:						
Die 349 grössten Orte des Deutschen Reichs	1909	22,890	17.6	17.7	24.0	17.3
18 grosse städtische Gemeinden der Schweiz	1908	887	4.7	10.9	15.6	13.3
72 Städte Frankreichs mit mehr als 30,000 Einwohnern	1908	8,269	6.3	15.8	10.1	7.6
76 grosse Städte Englands	1904	16,445	11.1	47.5	14.6	23.5
75 Städte Danemarks	1909	1,078	10.4	11.6	9.2	26.0
49 Städte Spaniens	1909	3,330	6.1	31.2	24.8	11.0
74 Städte Belgiens	1909	2,823	7.2	27.0	9.5	7.8
32 Städte Rumaniens	1909	996	72.1	4.8	16.8	3.7

[1] Ca. 48.9 Prozent der Gesamtbevölkerung.

So sehr diese Ziffern auch unter sich abweichen mögen, so zeigen sie doch, dass überall in Europa die übertragbaren Kinderkrankheiten eine ganz besondere Bedeutung in der Todesursachenstatistik haben, und dass im allgemeinen Masern und Röteln mehr Opfer fordern als der Scharlach, der Keuchhusten mehr als die zur Zeit ziemlich milde auftretende Diphtherie.

Die Mortalität dieser Krankheiten stellt aber nur einen Faktor ihrer volkswortschaftlichen Bedeutung dar, der besonders greifbar vor Augen tritt. Nicht so deutlich, aber nicht minder bedeutend ist der Faktor, der in anderer Weise auf das Nationalvermögen, das in

diesen jungen Menschen steckt, schädigend einwirkt. Wir wissen nämlich, dass alle diese Krankheiten sich häufig mit anderen Krankheiten komplizieren und dadurch schwere Nachteile auch für das Kind mit sich bringen können, das nun nicht gerade der Krankheit erliegt. So führt die im allgemeinen ja seltener auftretende spezielle Kinderlähmung nicht so oft zum Tode als vielmehr zu einer mehr oder minder starken Verkrüppelung. Die Meningitis tritt zwar mit einer Letalität von 60–70 Prozent auf, aber diejenigen, die mit dem Leben davonkommen, behalten meist irgend ein Gebrechen zurück: Schwerhörigkeit, Sprachfehler, Taubstummheit, Geistesschwäche, Augenfehler und Lähmungen. Der Keuchhusten ist weniger an sich gefährlich als dadurch, dass er eine Disposition zur Tuberkulose schafft, die erst nach Jahren zum Ausbruch kommt und so die verspätete Folge der Kinderkrankheit darstellt. Jedes 4. und 5. Kinderkrank bei Scharlach an Ohrenleiden, die oft Jahre lang bestehen und einen mehr oder minder starken Hörverlust bedingen können. Nicht ebenso häufig, aber häufiger, als man gemeinhin denkt, ist dieselbe Erscheinung bei den Masern. In Deutschland sind 15 Prozent der taubstummen Kinder, die in Anstalten untergebracht sind, im Verlaufe des Scharlachs ertaubt, 6.1 Prozent bei Masern, 2.6 Prozent bei Diphtherie, 9 Prozent bei epidemischer Genickstarre. Nach Masern bleiben oft katarrhalische Zustände bestehen, die monate- und selbst jahrelang anhalten können und eine hohe Tuberkulosegefährdung mit sich bringen. Bei Scharlach sind Nierenleiden und Herzkrankheiten eine häufige Folge. In vielen Fällen wird aber eine Kinderkrankheit nicht zu einen ausgesprochenen chronischen Lieden führen, sondern Folgen hinterlassen, die sich in Schwächlichkeit, Zartheit der Organe und Herabsetzung der Gesamtkonstitution äussern.

Angesichts dieser Sachlage muss man zu der Ueberzeugung kommen, dass die Bekämpfung der übertragbaren Kinderkrankheiten bis jetzt ausserordentlich vernachlässigt worden ist, wenn man überhaupt von einer Bekämpfung sprechen kann. Wenn in fast allen Ländern ein Rückgang in der Sterblichkeit bei Scharlach, Diphtherie und zum Teil auch bei Keuchhusten erfolgt ist, so ist diese Frucht uns ohne unser besonderes Darzutun in den Schoss gefallen und lediglich den Fortschritten der allgemeinen Hygiene zu verdanken, die aber fest gänzlich bei den Masern versagt hat. Ein aktives Vorgehen ist bisher nirgends erfolgt und wenn man versucht hat, diesen Krankheiten mit denselben Waffen der Seuchenbekämpfung zu begegnen wie bei der Pest, der Cholera und dem Typhus, so hat man sich überzeugen müssen, dass irgend ein greifbarer Nutzen dabei nicht herausspringt, sondern dass diese Aktion ein Schlag ins Wasser war. Es ist unbedingt notwendig, die Bekämpfung der übertragbaren Kinderkrank-

heiten in besondere Bahnen zu lenken, die den Eigentümlichkeiten dieser Krankheiten auch gerecht werden.

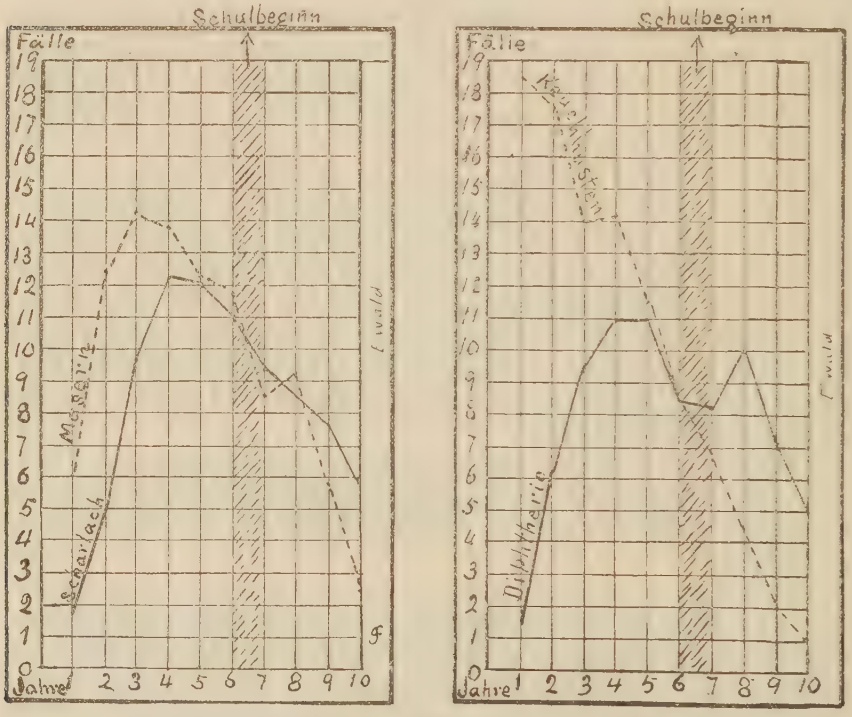
Ein systematisches Vorgehen gegen diese Krankheiten ist nur möglich, wenn man den Ursachen ihres Auftretens und den Wegen ihrer Verbreitung nachgeht, ebenso wie die Bekämpfung des Typhus nur dadurch ermöglicht worden ist, dass man die Erreger kennen lernte und fand, dass er durch Gegenstände, durch Wasser, durch Milch, durch andere Nahrungsmittel und schliesslich gar durch gesunde Menschen, durch Bazillenträger verbreitet wurde. Bei den übertragbaren Kinderkrankheiten ist man, wenn man von Genickstarre und Keuchhusten absieht, nicht so gut daran, da man den Erreger nicht kennt. Man muss daher auch die bakteriologische Komponente bei der Bekämpfung dieser Krankheiten vernachlässigen oder kann doch wenigstens nach dieser Richtung einen wirklichen Kampf nicht aufnehmen.

Bei der heutigen Sachlage muss man die Masern als eine unvermeidbare Krankheit ansehen und nur danach zu trachten suchen, dass ihre schlimmen Folgen abgelenkt werden, bei allen andern ansteckenden Kinderkrankheiten handelt es sich dagegen um vermeidbare Krankheiten, denen man daher auch mit grösster Energie entgegentreten muss, um ihre Verbreitung zu verhindern oder gar ihr Aufkommen unmöglich zu machen. Es wird daraus eine beachtenswerte Verschiedenheit in dem aktiven Vorgehen und in dem Ziel, das man sich setzt, resultieren.

Zunächst sollen einige charakteristische Eigentümlichkeiten hervorgehoben werden, die den Kinderkrankheiten gemeinsam sind, und die darum auch eine gewisse Gleichartigkeit bei der Bekämpfung ermöglichen.

Alle 4 Krankheiten—Masern, Scharlach, Diphtherie, und Keuchhusten—auf deren Besprechung ich mich beschränke, sind dadurch, wie ich schon erwähnte, ausgezeichnet, dass sie bei der heutigen Sachlage fast ausschliesslich das jugendliche Alter befallen, wenn auch bei den Masern dafür andere Ursachen massgebend sind als bei den andern Krankheiten, die durch eine besondere Empfänglichkeit der jugendlichen Personen ausgezeichnet sind. Wenn wir zunächst die Erkrankungshäufigkeit ins Auge fassen, so gibt folgendes Diagramm eine gute Uebersicht über die Verteilung der Krankheiten auf die einzelnen Altersklassen. (Abbildung I.) Die Ziffern selber rühren von Both her. Die prozentuale Erkrankungsfähigkeit, einmal an Masern und Scharlach, das andere Mal an Keuchhusten und Diphtherie, ist für die Altersklassen des Kindesalters dargestellt. Der Raum zwischen dem sechsten und siebenten Lebensjahr, der im allgemeinen den Termin der Einschulung bezeichnet, ist durch eine schraffierte Säule kenntlich gemacht. Masern,

Scharlach, und Diphtherie sind dadurch gemeinsam charakterisiert, dass sie das erste Lebensjahr nur wenig befallen, alsdann schnell ansteigen, um im dritten und vierten Lebersjahr ihr Maximum zu erreichen. Darauf fallen sie mehr oder minder steil ab. Masern und Diphtherie zeigen jedoch im achten Lebensjahr einen charakteristischen Gipfel, der wahrscheinlich auf die vermehrte Infektionsgelegenheit infolge des Schulbesuchs zurückzuführen ist. Beim Scharlach macht sich diese Erscheinung nicht bemerkbar, nur scheint die Kurve etwas langsamer abzufallen. Der Keuchhusten tritt ganz

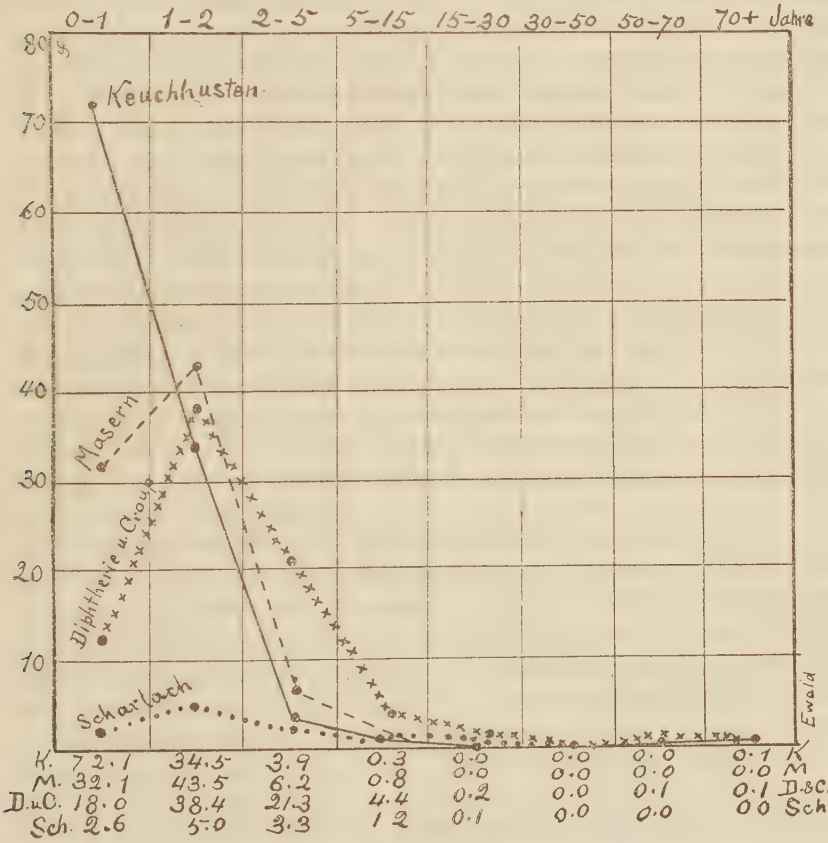


entgegengesetzt im ersten Lebensjahr besonders stark auf, und seine Kurve fällt von da ab bis zum zehnten Lebensjahr in ziemlich gleichmässiger Steilheit ab, nur das vierte Lebensjahr zeigt eine kleine Verzögerung, die vielleicht auf die vermehrte Infektionsmöglichkeit durch Kinderhorte und Kindergärten zurückzuführen ist.

Durchaus anders ist das Bild, wenn man dieselben Krankheiten nach ihrer Verteilung auf die einzelnen Altersklassen als Todesursachen betrachtet. Dies geht aus einem Diagramm hervor, das die Sterblichkeit in Bayern während der Jahre 1893–1902 darstellt. (Abbildung II.) Hier ist die Sterblichkeit der einjährigen Kinder am grössten beim Keuchhusten, während bei allen andern Kinderkrankheiten das zweite Lebensjahr dominiert und sich in entsprech-

ender Höhe auch beim Keuchhusten hält. Dann sinkt die Kurve etwas, erreicht aber erst im 6. Lebensjahre geringere Werte, um dann schliesslich nach dem 15. Lebensjahre auf Null oder beinahe auf Null herabzusinken. Die verschiedenartige Beteiligung der Geschlechter kann für unsern Zweck hier ausser acht gelassen werden.

Für die Bekämpfung der ansteckenden Kinderkrankheiten kommen demgemäss zwei verschiedene Momente in Betracht, in erster Linie wird man sich gegen die todbringenden Komponente wenden müssen,



in zweiter Linie wird man die Krankheiten überhaupt zu bekämpfen haben. Beide Aufgaben sind nicht ohne weiteres identisch. Bei den Masern z. B. erscheint es unmöglich, diese Krankheit überhaupt mit Aussicht auf Erfolg zu tilgen; wir müssen immer noch die Masern als eine unvermeidbare Krankheit ansehen, der nur sehr wenige Menschen zu entgehen vermögen, bei den andern Krankheiten könnte schon eher die Bekämpfung der Krankheiten selber eine Aussicht auf Erfolg bieten. Wenn wir zunächst uns gegen die in Frage kommenden Krankheiten als Todesursache wenden, so ist ersichtlich, dass

hier in der Hauptsache die Kinderwelt in Frage kommt, soweit sie nicht schulpflichtig ist. Wir sehen, dass bei Masern, Scharlach und Diphtherie die Säuglinge auffallend verschont bleiben.

Diese sehr eigenartige Erscheinung ist wohl darauf zurückzuführen, dass die Kinder infolge ihrer mangelhaften Bewegungsfähigkeit und ihres Aufenthalts in der Wiege oder im Kinderbett keine Gelegenheit haben, mit andern Infektionsträgern zusammenzukommen und sich selten infizieren. Soweit die Säuglinge aber erkranken, haben sie einen gewissen natürlichen Schutz, der wohl hauptsächlich durch die Muttermilch bedingt ist. Bei den Masern ist das ohne weiteres einleuchtend. Denn bei allen Erwachsenen, die Masern überstanden haben, müssen sich Immunkörper im Blut befinden, die nun durch die Muttermilch auf die Säuglinge übertragen werden. Wen daher die Erkrankung aucht nicht verhindert wird, so wird sie doch weniger stürmisch auftreten und daher auch seltener zu Komplikationen Veranlassung geben. Bei Scharlach und Diphtherie werden wohl nur in seltenen Fällen Immunkörper direkt durch die Muttermilch übertragen werden, aber es wird durch die Muttermilch der ganze Gesundheitszustand der Säuglinge gehoben, und es werden vielleicht auch allgemein schützende Stoffe übertragen, die mildernd auf den Krankheitsverlauf einwirken können. Sobald aber die Ernährung durch die Mutterbrust auhört, was Ende des 1. Lebensjahres oder zu Beginn des 2. zu geschehen pflegt, so tritt die tödliche Wirkung der Krankheiten in auffallender Weise zutage. Aus andern Untersuchungen wissen wir, dass die Sterblichkeit an ansteckenden Kinderkrankheiten in einem bestimmten Verhältnis zu der Wohlhabenheit steht, derart dass in ärmeren Gegenden oder Stadtteilen die Sterblichkeit höher ist als in reicheren. Eine besondere Gefährdung besteht für diejenigen Kinder, die an Rhachitis leiden: sie sind in ihrer ganzen Konstitution derartig geschwächt, dass sie den ansteckenden Krankheiten keine ausreichenden Abwehrmittel gegenüberstellen können und daher häufig erliegen. Wenn man den Krankheiten Masern, Scharlach und Diphtherie als Todesursachen begegnen will, wird man in erster Linie darauf hinzuwirken haben, dass das Stillgeschäft möglichst in allen Fällen und hinreichend lange durchgeführt wird, da die Mutterbrust den Säuglingen einen ausgezeichneten Schutz nicht vor der Ansteckung, aber wohl vor den Folgen dieser Krankheiten gewährt. Man wird dann weiterhin alle Massregeln begrüssen müssen, die der Bekämpfung der englischen Krankheit und der Wohnungsfürsorge dienen, da auch hierdurch ein gelinderes Auftreten der ansteckenden Kinderkrankheiten gewährleistet wird.

Ganz anders liegen die Verhältnisse beim Keuchhusten. Je jünger das Kind ist, um so leichter wird es angesteckt, je jünger es ist, um so leichter erliegt es auch der Krankheit. Man wird hieraus

die Nutzanwendung ziehen müssen, dass allen Massnahmen zur Verhütung der Ansteckung hier eine ganz andere Bedeutung zuerkannt werden muss, als das bisher gemeinhin geschah. Was für den Keuchhusten überhaupt und dabei in erster Linie für das 1. Lebensjahr gilt, das hat aber dieselbe Berechtigung bei den andern Krankheiten vom 2.–5. Lebensjahre. Eine jeder neue Krankheitsfall schafft bei dieser Alterklasse eine grosse Wahrscheinlichkeit für einen unglücklichen Ausgang, und je jünger das betroffene Kind ist, um so grösser ist das Risiko. Man unterschätzt gemeinhin in ärztlichen Kreisen die grosse Gefahr, die den jüngeren Familienmitgliedern durch die Ansteckungsmöglichkeit entsteht. Der praktizierende Arzt denkt in erster Linie an die Gesundung seines Patienten und in zweiter Linie erst, wenn überhaupt, an die ausreichende Isolierung. Wenn irgendwo, so ist gerade hier der Satz zu beherzigen: Krankheiten verhüten ist besser, denn Krankheiten heilen. Wenn sich ein Kind von etwa 8 Jahren in der Schule Masern holt, so ist das an sich ganz unbedenklich. Gefährlich ist aber die Infektionsgefahr, die damit den jüngeren Geschwistern droht, und die Todesgefahr, die um so grösser ist, je jünger die Geschwister sind. Und was für die Masern gilt, das hat auch für die andern Kinderkrankheiten entsprechend Geltung. In den meisten Fällen ist eine ausreichende Isolierung der Erkrankten in der Familie nicht möglich. Es müssen daher Gelegenheiten geschaffen werden, solche Isolierungen in anderer Weise zu erzielen. Das kann dadurch geschehen, dass die kranken Kinder in Krankenhäuser überführt werden.

So probat dieses Mittel in der Theorie sein mag, so oft versagt es in der Praxis. Man kann einer Mutter schlecht zumuten, dass sie ihr schwerkrankes Kind aus dem Hause und in fremde Hände gibt, und tatsächlich weigern sich denn auch die Mütter beharrlich und nur dort gelingt es, die Kinder in Krankenhäuser zu bringen, wo entweder sehr grosse Einsicht über die mütterlichen Gefühle siegt, oder wo solche mütterlichen Gefühle überhaupt nicht bestehen. Die Isolierung im Krankenhause ist aber auch durchaus nicht so einwandsfrei, wie man dies a priori annehmen könnte. Da, wo sie häufiger durchgeführt wird, macht man immer wieder die Erfahrung, dass die klinisch genesenen Kinder nach ihrer Rückkehr in die Familie häufig die gesunden Geschwister anstecken. Bei der Diphtherie lässt sich das vermeiden, wenn man nicht nach der klinischen Genesung, sondern danach sich richtet, wie lange die Genesenen noch Bazillen beherbergen und sie solange im Krankenhause zurückhält. Dast ist aber dann schwierig, wenn bei Massenepidemien der Zudrang der schwer Kranken zu gross wird und daher die klinisch Genesenen Platz machen müssen, ehe die bakteriologische Heilung abgewartet werden kann. Aber bei Scharlach kann man überhaupt nicht sagen, wann der Rekonvalescent seine Infektiosität verloren hat, und

wenn man im allgemeinen den Zeitraum von 6 Wochen annimmt, so sieht man, dass viele Infektionen entstehen, wenn klinisch gesunde Kinder nach 6wöchentlicher Isolierung wieder in die Familie zurückkehren. Bei Massern bestehen keine solchen Bedenken, wenn hier die Isolierung im Krankenhause wohl allerdings selten sein wird, und beim Keuchhusten spielt die Hospitalisierung überhaupt keine Rolle.

Eine wirksame Isolierung kann nun aber leicht dann durchgeführt werden, wenn man nicht die kranken, sondern die gesunden Kinder entfernt. Meines Wissens besteht eine derartige Uebung in Deutschland in ausgedehnter Weise nur bei Scharlach. Im Jahre 1911 wurden in Bremerhaven, abgesehen von Erkrankungen, die aus der Nachbarschaft oder durch den Schiffsverkehr in Krankenhäuser kamen, 26 Scharlachfälle von Kindern oder jugendlichen Personen bei einer Bevölkerung von 23,000 Einwohnern beobachtet. Von diesen 26 Kranken wurden 12 in ein Krankenhause überführt, 12 wurden in der Familie behandelt, aber ausreichend isoliert, wenn Geschwister vorhanden waren. Die 26 Kranken hatten fast immer jüngere oder ältere Geschwister, nur in zwei Fällen waren Geschwister nicht vorhanden. In 9 Fällen wurde die Isolierung dadurch bewirkt, dass die Geschwister zu Verwandten oder anderen Personen in Pflege gegeben wurden, und zwar handelte es sich dabei um 11 Kinder, während die 26 Kranken im ganzen 44 Geschwister hatten. Die Massnahmen bewährten sich so gut, dass eine Weiterverbreitung durch die erkrankten Personen ausgeschlossen war. Der einzige Fall, in dem ein genesenes Kind seine bis dahin gesunden Geschwister infizierte, betraf merkwürdigerweise einen Knaben, der ins Krankenhaus überführt und dort 6 Wochen zurückgehalten war.

Von der Unterbringung gesunder Kinder in andern Familien wird aber, wie ich schon erwähnte, nur bei Scharlach Gebrauch gemacht, hier kommen auch die kranken Kinder häufiger ins Krankenhaus. Masern werden aber stets im Hause behandelt und die andern Kinder werden nicht isoliert, weil man die Krankheit für unvermeidlich und auch ungefährlich hält. Die Todesursachenstatistik belehrt uns aber eines Andern. Bei Keuchhusten liegen die Verhältnisse ähnlich. Es ist gerade bei diesen Krankheiten ein viel grösseres Gewicht auf die ausreichende Isolierung der kranken Kinder oder der gesunden Geschwister zu legen. Diese Isolierung wird gewöhnlich vernachlässigt, weil in den meisten Staaten Masern und Keuchhusten nicht anzeigepflichtig sind und darum die Mutmassung gleichsam behördlich bestätigt wird, dass hier die Ansteckungsgefahr unbedeutend und zu vernachlässigen sei, weil der Staat sich um diese Krankheiten nicht kümmert. Ueberall da, wo die Ueberführung ins Krankenhaus auf Schwierigkeiten stösst, sollte man die gesunden Kinder ausser dem Hause unterzubringen suchen. Das ist häufig nicht schwierig,

in andern Fällen wird man allerdings die Mitwirkung von Behörden oder Wohltätigkeitsvereinen nachzusuchen haben. Auch dann wird man immer nur Erfolge haben, wenn die Familien nicht zu kinderreich sind. Die wirksame Isolierung der Kranken, die Verhinderung der Uebertragung von Krankheitskeimen auf die gesunden Familienmitglieder wird eine der dankbarsten Aufgaben der praktizierenden Aerzte sein und ist durch keine behördliche Massregel zu ersetzen.

Am schlimmsten ist man aber beim Keuchhusten daran, der über Monate sich hinzieht und darum die Wachsamkeit einschläfert. Man hat vorgeschlagen, die keuchhustenkranken Kinder in besonderen Kindersanatorien an der See oder anderen günstigen Plätzen unterzubringen und man hat gelegentlich auch diesen Gedanken durchgeführt. Eine solche Anhäufung keuchhustenkranker Kinder bringt indessen grössere Gefahren, als dem therapeutischen Nutzen entspricht. Eher dürfte es angezeigt sein, die gesunden Kinder aus den Familien herauszubringen, das dürfte sich jedoch erst bei einer weiter entwickelten Jugendfürsorge ermöglichen lassen, als wir sie heute im allgemeinen haben. Gerade beim Keuchhusten, der so viele Opfer fordert und die gefährlichste Kinderkrankheit überhaupt ist, sind unserm Handeln Schranken auferlegt. Man wird aber auch hier in sehr vielen Fällen vorbeugen können, wenn man sich der ganzen Gefahr der Situation bewusst ist und überhaupt vorbeugen will.

Es braucht wohl nur flüchtig darauf hingewiesen zu werden, dass die Einführung des Heilserums einen günstigen Einfluss auf die Sterblichkeit bei Diphtherie ausgeübt hat. Ein Mittel zur Bekämpfung der Krankheit selber ist es allerdings nicht geworden. Die prophylaktische Anwendung des Serums schützt nicht sicher vor der Inkfektion, und der hohe Preis hat die weitere Verwendung bisher gehindert.

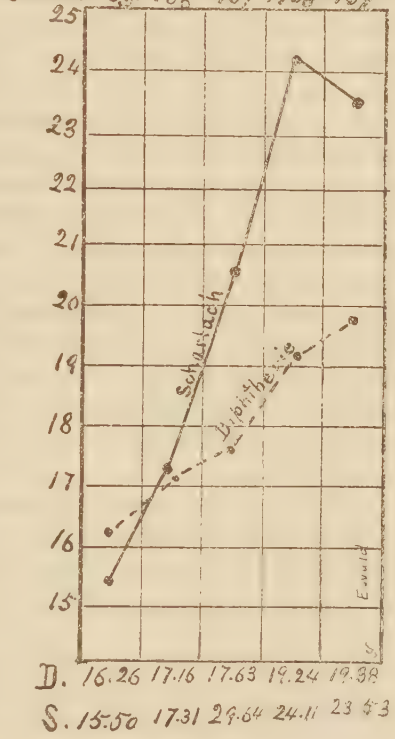
Von denjenigen Umständen, die auf die Sterblichkeit an ansteckenden Kinderkranheiten einen Einfluss haben, ist schliesslich noch die Mangelhaftigkeit der ärztlichen Versorgung zu erwähnen. In vielen Fällen wird ein Arzt nicht hinzugezogen, oft bleibt die Krankheit überhaupt unerkannt. Dann ist der Verbreitung Tür und Tor geöffnet. So kam es im vorigen Jahre in Bremerhaven in der Vorschule des Gymnasiums zu einer Klassenepidemie von 5 Scharlachfällen, die ihren Ausgang von einem Schüler genommen hatte, der an einem leichten Scharlach erkrankt und ärztlich nicht behandelt war und schon nach wenigen Tagen von den Eltern wieder zur Schule geschickt wurde. Er infizierte seine nächsten Nachbarn in der Klasse, von denen einer leider der Krankheit zum Opfer fiel. Bei der Untersuchung durch den Schularzt stellte sich heraus, dass der Knabe noch im Abschuppungsstadium und somit höchst infektiös

war. Nach seiner Eliminierung und der Desinfektion des Klassenzimmers hörten die Scharlacherkrankungen in der Klasse auf. Masern und Keuchhusten kommen nur selten in ärztliche Behandlung und haben gerade deshalb eine so ausserordentliche Verbreitung und verderbliche Wirkung.

Ich habe damit die vier Krankheiten charakterisiert, soweit sie ihre tödliche Wirkung entfalten und kurz auf ihre Bekämpfung hingewiesen. Die Art und Weise, wie man der Verbreitung der Krankheiten selber zu begegnen versucht, ist ganz anders. Man geht hier wie bei der Seuchenbekämpfung überhaupt vor. Die Seuchenbekämpfung ist in Deutschland im allgemeinen so organisiert, dass für gewisse ansteckende Krankheiten eine Anzeigepflicht besteht. Auf Grund der eingelaufenen Anzeigen stellt der beamtete Arzt darüber Ermittelungen an, wie die Krankheit entstanden, welches der Ansteckungsmodus gewesen ist, und macht dann seine Vorschläge zur Bekämpfung, die sich auf die Verstopfung der Ansteckungsquelle und die Verhinderung der Weiterverbreitung der Krankheit beziehen. Dieses Vorgehen hat sich vorzüglich bei Pest und Cholera und in beschränkterem Masse bei Typhus bewährt. Von den Kinderkrankheiten sind aber nur Scharlach und Diphtherie anzeigepflichtig. Auf die Bekämpfung von Masern und Keuchhusten verzichtet man von vornherein vollständig. Bei Scharlach und Diphtherie sind die Ermittelungen in die Hände der behandelnden Aerzte gelegt, der beamtete Arzt ist also ausgeschaltet. So segensreich es sein kann, wenn man den behandelnden Arzt zur Seuchenbekämpfung heranzieht, so aussichtslos ist es solange, als man die praktizierenden Aerzte bei ihrer Vorbildung nicht in der Seuchenbekämpfung unterrichtet. Das geschieht heute in mangelhafter Weise. Aber auch sonst ist die Bekämpfung des Scharlachs und der Diphtherie schwieriger als die anderer Infektionskrankheiten. Beim Scharlach kennt man den Erreger nicht einmal und bei beiden Krankheiten die Verbreitungswege entweder überhaupt nicht oder höchst mangelhaft. Dazu kommt, dass die Bebämpfung einer endemisch verbreiteten Krankheit immer viel schwieriger ist, als wenn es sich um eine einmalige akute Epidemie handelt.

Der Scharlach tritt in epidemischer Form recht selten auf, meist kommen überall vereinzelte Fälle vor und zu manchen Zeiten häufen sich solche Fälle. Aehnlich steht es mit der Diphtherie. Bei dieser beobachtet man aber häufiger epidemische Einfälle, die dann meist auf eine besondere Art der Verbreitung, z. B. durch Milch zurückzuführen sind. Bei solchen akuten Epidemien ist es meist nicht schwierig, den Verbreitungsweg zu finden und man hat hier mit den üblichen Mitteln der Seuchenbekämpfung vorzügliche Erfolge erzielt. Die Bekämpfung der endemischen Diphtherie erschöpft sich dagegen in der Eruierung von Bazillenträgern

und Isolierung dieser teils gesunden, teils kranken Bazillenträger. Einen Einfluss hat dieses Vorgehen natürlich auf den Gang der Seuche nicht haben können. Seit dem Jahre 1905 ist in Preussen ein neues Seuchengesetz in Kraft, das den modernen Forderungen der Seuchenbekämpfung Rechnung trägt. Sie sehen nun auf diesem Diagramm die Scharlach- und Diphtherieerkrankungen seit 1905 dargestellt. (Abbildung III) Hierzu ist einschränkend zu sagen, dass es sich nur um die gemeldeten Fälle handelt und in wirklichkeit nicht alle Fälle auch gemeldet werden. Aber der Fehler, der hieraus entsteht, bleibt in den einzelnen Jahren derselbe, so dass man die Ergebnisse der einzelnen Jahre wohl miteinander vergleichen kann. Sie werden sich überzeugen, dass von einem Zurückgehen der Erkrankungen keine Rede sein kann. Die Diphtherie nimmt beständig zu und hat eine bedrohliche Höhe erreicht. Der Scharlach erreichte im Jahre 1908 sein Maximum, aber sein Abfall, der dann einsetzt, hängt nicht von der Wirkung des Seuchengesetzes ab, sondern entsteht aus der Periodizität, mit der die Kinderkrankheiten aufzutreten pflegen, und auf die ich hier nicht näher eingehen kann. Die heutige Art der Bekämpfung der ansteckenden Kinderkrankheiten ist also teils ein Schlag ins Wasser, teils, soweit Masern und Keuchhusten in Frage kommen, ein eingestandener Verzicht auf die Möglichkeit einer Einwirkung durch die Seuchengesetzgebung.



Abgesehen von dieser offiziellen Art der Bekämpfung der Kinderkrankheiten durch die Seuchengesetzgebung gibt es noch eine Bekämpfung, die sich indirekt aus der Tätigkeit der Schulärzte ergibt. So verschiedenartig die Schulorganisation an den einzelnen Plätzen auch sein mag, so wird doch immer eine gewisse Einwirkung auf die ansteckenden Kinderkrankheiten bestehen. Am vollkommensten lässt sich das da erreichen, wo jeden Tag ein Schularzt in die Schule kommt und in der Lage ist, die kranken oder verdächtigen Kinder sofort zu untersuchen. Die Bekämpfung der ansteckenden Kinder-

krankheiten durch die Schulen hat nach zwei Richtungen eine Bedeutung. Einmal kann sie die Uebertragung einer Erkrankung von einem Schulkind auf das andere und indirekt damit das Hineintragen von Infektionsstoff in Familien verhindern, die bis dahin mit dem infektiösen Material nicht in Berührung gekommen waren. Es ist also hier die Aufgabe, zu verhüten, dass die Schule als Verbreitungsweg einer Seuche dient. Die weitergehende Aufgabe kann aber die sein, durch die erkrankten Schulkinder solche Familien zu eruieren, in denen andere Kinder vorhanden und daher also auch bedroht sind und eventuell Massnahmen zu veranlassen, die einer Weiterverbreitung durch diese Kinder begegnen. Die Frage, wieweit die Schule eine Bedeutung bei der Verbreitung der ansteckenden Krankheiten hat, ist recht umstritten. Theoretisch ist die Möglichkeit gegeben, dass ein krankes Kind sämtliche Klassengenossen und weiterhin auch andere Schulkinder anstecken kann, so dass die betreffende Seuche wirklich als Schulkrankheit anzusehen wäre. Die Infektiosität ist nun aber nur bei den Masern so stark, dass eine derartige Verbreitung wirklich ernstlich zu fürchten wäre: bei den andern Krankheiten wird es immer nur zu Einzelinfektionen kommen, die sich dann allerdings kettenartig fortsetzen können. Für die Verbreitung der Masern durch die Schule möchte ich auf folgende kleine Tabelle hinweisen, die eine Uebersicht über eine Masernepidemie und das Zustandekommen der Infektion gibt. Im Winter 1860–61 beobachtete man in Frankfurt a. M. eine Epidemie von 733 Fällen. Die Verbreitung war folgende:

	November.	Dezember.	Januar.	Februar.	März.	April.	Mai.
Uberhaupt erkrankt	79	131	100	77	133	96	55
In den Schulen	49	79	46	31	56	34	9
Prozent	62	52	46	40	42	35	16

Es zeigt sich also, dass die Verbreitung der Epidemie durch die Schulen im Anfang der Epidemie sehr bedeutend war. Die Maserninfektion wurde zuerst durch die Schulen verbreitet und von da in die Familien gebracht, in zweiter Etappe folgte dann die Uebertragung selber in den Familien auf die noch nicht durchmaserten Geschwister. Im Verlaufe der Epidemie wurde die Zahl der Ansteckungen durch die Schulen immer geringer und sank allmählich von 62 Prozent völlig regelmässig mit einmaliger Unterbrechung bis auf 16 Prozent herab. Auch heute werden mancherorts solche Massenepidemien beobachtet, denen nur durch Schluss der betreffenden Klasse oder gar der Schule auf 14 Tage begegnet werden kann. Im allgemeinen aber werden auch bei den Masern heute eigentliche Klassenepidemien zu den Ausnahmen gehören. In Frankfurt a. M., z. B., würde bei der heutigen Grösse und Enwicklung

der Stadt eine derartige Schulepidemie nicht mehr möglich sein. Das hängt damit zusammen, dass die ansteckenden Kinderkrankheiten ihr periodisches Auftreten geändert haben. Früher traten die Masern in regelmässigen Abständen von 2–3 Jahren auf, um inzwischen völlig zu erlöschen. Wenn ein Fall in eine Stadt eingeschleppt wurde, verbreitete sich die Krankheit schnell weiter, bis alle Kinder, die noch nicht durchmasert waren, die Masern überstanden hatten. Dann hörte gewissermassen das Material auf und die Seuche kam zum Erlöschen. Das hat sich nun durch die Zunahme des Verkehrs geändert, so dass dieser Typus nur in entlegenen Gegenden oder auf dem Lande noch vorkommen kann. Heute sterben die Masern in jeder grösseren Stadt nicht aus, sondern schleppen sich dauernd fort. Die meisten Kinder haben daher bei ihrem Eintritt in die Schule Masern schon gehabt.

In Bremerhaven wird im ersten Schuljahre festgestellt, welche Kinder früher schon Masern gehabt haben. Dabei hat sich ergeben, dass 91.55 Prozent der Kinder vor dem ersten Schuljahre bereits Masern gehabt haben. Da die durchmaserten Kinder vor erneuter Infektion geschützt sind, bedürfen sie auch im Falle einer Epidemie keiner Aufsicht. Die wenigen anderen Kinder sind natürlich leicht zu beobachten. Auch wenn sie sämtlich auf einmal erkranken, erübrigt sich ein Schul- oder Klassenschluss, da selbst in den untersten Klassen meist nur 1–3 Kinder noch nicht durchmasert sind. Es wird überall in den Schulen notwendig sein, festzustellen, wie viele Kinder schon früher Masern gehabt haben. Insofern muss übrigens auch heute der Schule ein Einfluss auf die Verbreitung der Masern zugestanden werden, als zu Beginn des Schuljahres immer eine ganze Anzahl von neueingeschulten Kindern, die noch nicht durchmasert waren, erkranken. Die Fernhaltung von Kindern, die an Keuchhusten erkrankt sind, aus der Schule erledigt sich gewöhnlich dadurch von selbst, dass die Lehrpersonen hier wegen der alarmierenden Symptome schon rechtzeitig selbst einzugreifen pflegen. Bei Scharlach und Diphtherie erübrigt sich in Bremerhaven ein besonderes Eingreifen des Schularztes, da nach dem bremischen Seuchengesetz die Bekämpfung in etwas anderer, mehr dem Zweck entsprechender Form als in Preussen erfolgt. In allen Fällen wird der Schularzt sowohl durch die Schule als auch durch die Behörde von jedem Fall von Scharlach und Diphtherie, bei Masern, Keuchhusten und andern Infektionskrankheiten ausschliesslich durch die Schule benachrichtigt und kann somit den Stand der Epidemie hinsichtlich der Verteilung auf die Klassen und Schulen jederzeit verfolgen und eventuell rechtzeitig eingreifen. Bei Scharlach und Diphtherie werden in jedem Falle umfangreiche Ermittelungen angestellt und für Isolierung Sorge getragen, wobei ich auf die früher für Scharlach genannten Zahlen hinweise. Ueber die Geschwister der Er-

krankten wird ein Schulverbot ausgesprochen, dessen Dauer der beamtete Arzt vorschlägt. Bei Diphtherie wird das Schulverbot erst aufgehoben, wenn durch bakteriologische Untersuchung festgestellt ist, dass weder der Genesene noch die gesund gebliebenen Geschwister Bazillenträger sind. Diese Massnahmen erweisen sich für die Bekämpfung der ansteckenden Kinderkrankheiten in den Schulen als ausreichend.

Noch wichtiger als die Ueberwachung der Schulen ist diejenige von Krippen, Kinderhorten, Waisenhäusern und ähnlichen Anstalten, in denen jüngere Kinder des Tags über untergebracht werden, während die Eltern der Arbeit nachgehen. Nier ist die Gefahr einer Ansteckung deshalb so viel grösser, als es sich einmal um Kinder in niedern Altersklassen handelt, die eine grössere Empfänglichkeit für die ansteckenden Krankheiten und auch eine grössere Mortalität haben als die älteren Kinder, sodann aber deswegen, weil kleinere Kinder beim Spielen viel inniger miteinander in Berührung kommen und darum Infektionsstoffe leichter unter sich austauschen. Es ist daher unbedingt notwendig, dass auch solche Anstalten unter ständiger ärztlicher Ueberwachung stehen, und dass die Zulassung zum Besuch derselben unter denselben Kautelen erfolgt wie bei den Schulen.

Ich habe schon erwähnt, dass die Schulen und Kleinkinderanstalten über den jetzigen Rahmen hinaus der Ausgangspunkt für eine wirksame Bekämpfung der Kinderkrankheiten werden könnten, wenn man von den Erkrankungsfällen ausgehen und eine aktive Füsorge in den betroffenen Familien ausüben würde. Denn dass ein Schulkind von 6–8 Jahren an Masern oder Keuchhusten erkrankt, ist quoad vitam harmlos und auch bei Scharlach und Diphtherie nicht allzu gefährlich. Die Gefahr besteht hauptsächlich darin, dass nun die jüngeren Geschwister infiziert werden. Sie sind erheblich gefährdet und zwar, wie ich schon ausführte, um so mehr, je jünger sie sind. Von vornherein müsste hier ein aktives Vorgehen stattfinden, derart, dass besondere Hilfsbeamte des Schularztes oder des beamteten Arztes in der Familie die Zustände feststellen und darüber Bericht erstatten. Alsdann könnte man darauf hinwirken, dass entweder in der Familie eine ausreichende Isolierung stattfindet oder der Kranke in ein Krankenhaus kommt oder die gesunden Geschwister aus der Familie entfernt werden. In allen Fällen könnte man auf die Beschaffung ärztlicher Hilfe hinwirken und könnte der Behörde eventuell Vorschläge für eine weitergehendes Vorgehen machen. Am zweckmässigsten würde man diese neue Art der Fürsorge an die jetzt schon vielfach geplanten und zum Teil in Wirklichkeit umgesetzten kommunalen Wohlfahrtsämter oder Jugendfürsorgeämter angliedern. Durch eine solche aktive Für-

sorge würde erreicht werden, dass in erster Linie dis Kranken selber zu ihrem Recht kämen. Gegenüber der grossen Verständnislosigkeit, die in den weitesten Kreisen über Krankheiten und Krankheitsbehandlung herrscht, ist es unbedingt nötig, dass die kleinen Kranken nicht solchem Unverstande zum Opfer fallen und wenigstens vernünftig gelagert und ernährt werden. Auch die Herbeiführung ärztlicher Behandlung wird sich in den meisten Fällen ermöglichen lassen.

In Deutschland ist die minderbemittelte Bevölkerung ausnahmslos in Krankenkassen versichert oder kommt jetzt in die Krankenversicherung durch die Reichsversicherungsordnung. Eine grosse Zahl von Krankenkassen haben Angehörigenunterstützung, d. h. Frau und Kinder des Versicherten erhalten im Erkrankungsfalle freie ärztliche Behandlung und Arznei. Von den neu eingeschulten Kindern der Volksschulen Bremerhavens z. B. erhalten 43.95 Prozent im Erkrankungsfalle derartige Unterstützung durch Krankenkassen; bei den andern handelt es sich entweder um Kinder bemittelter Eltern oder um Kinder, die ohne weiteres von der Armenfürsorge übernommen werden können. Die ärztliche Behandlung gewährt die Darreichung der zweckmässigen Arznei und sichert auch weitgehende Serumbehandlung bei Diphtherie. Ein derartiges Fürsorgeamt würde im Bedarfsfalle auch sonst für die Beschaffung von Heilserum sorgen können. Neben solcher Fürsorge für die Kranken könnte man vor allem aber die bis dahin gesund gebliebenen Kinder schützen und so etwas Wirksames zur Bekämpfung der ansteckenden Kinderkrankheiten tun. Der Fürsorgeabteilung würde es übrigens nicht schwer fallen, mit Hilfe von Standesämtern, Aerzten, Hebammen, Krankenkassen u. s. w. auch die andern Fälle von ansteckenden Krankheiten zu eruieren, die durch die Schulen noch nicht bekannt werden. Sie könnte auch im einzelnen die Verbreitungswege der Krankheiten kennen lehren und damit eine Grundlage für besondere Massnahmen schaffen.

Ich habe eingangs darauf hingewiesen, dass die ansteckenden Kinderkrankheiten in solcher Massenhaftigkeit auftreten, dass sie jedem Staate schwere Verluste an Menschenleben und damit an Nationalvermögen zufügen. Diese Verluste sind grösser als bei allen andern Infektionskrankheiten. Die bisherige Art der Bekämpfung hat vollständig versagt und muss darum auch durch anderweitige Einrichtungen ersetzt oder ergänzt werden. Hierbei werden sich je nach den örtlichen Verhältnissen verschiedene Massnahmen empfehlen, in allen Fällen wird es aber zweckmässig sein, eine neue Art besonderer Fürsorge ins Leben zu rufen, die zunächst von den Erkrankungen in den Schulen ausgehen könnte, um die einzelnen Krankheitsfälle festzustellen und dafür zu sorgen, dass sowohl die

66692—VOL 3, PT 1—13——12

tödlichen Wirkungen der Kinderseuchen als auch ihre Weiterverbreitung selber bekämpft wird. Im allgemeinen wird sich diese neue Fürsorge leicht in bestehende Einrichtungen eingliedern lassen und einen Nutzen erzielen, der in keinem Verhältnis zu den aufzuwendenden Kosten stehen muss.

THE SCHOOL CHILDREN OF THE STOCKYARDS DISTRICT.

[An investigation carried on under the direction of the Board of the University of Chicago Settlement.]

CAROLINE HEDGER, M. D., Chicago, Ill.

School children of the stockyards district.

'Tis a gray neighborhood—the Chicago Stockyards; smoke and dumps, and grimy houses; and, when formerly the children picked on the dumps, one had to watch closely for motion there, the general correspondence in the tone of the children, their clothing, and the surroundings, making them almost invisible. Sometimes, with the smoke, comes down the smell of the fertilizer plants, and this is not conducive to deep breathing or to sound sleep; and the children impress one as lacking oxygen—round-shouldered, thin, and rather pale.

This general impression made me go into the study of their physical condition with the idea that the cause of their retardation could easily be found in this field. Such is not the case. While the physical findings in the tables are alarming, when viewing the group as a whole, they are distributed in such a way as to make one suspect other causes to be in more direct connection with the school retardation. With their working efficiency later, undoubtedly, their physical condition will have much to do. Rather, this poor condition of the whole group serves as the underlying factor on which the other causes of retardation act with more or less violence. The future of the child is made up from this physical condition plus the education we give him. We must spend some time on these defects to realize the kind of citizens we are building, to get the picture of these physical conditions fixed to use as the background of other phases of the child's life.

Forty-eight per cent is the average amount of retardation, on Ayres's standard, in the two schools in this district from which the 800 pupils were studied. The investigation in the homes was done by Miss Montgomery, long in the neighborhood and in the schools, better fitted than anyone else to discover the truth. The school facts were supplied by Mrs. McArthur. All of us worked

under the Board of the University of Chicago Settlement, by whose permission I am able to give the data.

By grades, the children were distributed as follows:

TABLE I.—*Children by grades.*

	First.	Second.	Third.	Fourth.	Fifth.	Sixth.	Seventh.	Eighth.	Total.
Retarded	19	50	89	91	52	62	21	16	400
Normal	16	63	82	88	53	36	38	34	400

By ages, their distribution is according to Table II:

TABLE II.—*Children by ages.*

	6 years.	7 years.	8 years.	9 years.	10 years.	11 years.	12 years.	13 years.	14 years.	15 years.	16 years.	Boys.	Girls.	Total.
Retarded		2	13	51	57	56	51	70	73	26	1	247	153	400
Normal	3	42	76	80	64	42	43	33	17	....	....	213	187	400

Thus, of the 400 retarded children studied, 89 per cent of them were aged 9 to 14 years, and the great majority of the group came in grades 2 to 6; while of the 400 normal children, also mainly in grades 2 to 6, 86 per cent were of the ages 7 to 12.

The children were largely American born, 683 of them having been born here. The other 117 were distributed among 12 nationalities, 30 being Polish, 28 Austrian, 22 Bohemian, and the rest, in lesser number, Slovak, German, Russian, Irish, Scandinavian, Hungarian, English, Italian, and Canadian. The parentage was mainly foreign, 41 children only having both parents American, and these were for the most part second-generation immigrants. The nationality of the parents was found to be almost wholly Slavic. (See Table III.)

TABLE III.—*Nationality of parents.*

	Both American.	Both parents foreign.								One parent foreign.							
		Bohemian.	German.	Irish.	Lithuanian.	Polish.	Slavic.	Other.	Total.	Bohemian.	German.	Irish.	Lithuanian.	Polish.	Slavic.	Other.	Total.
Retarded	16	84	31	50	32	105	17	12	331	4	15	12	1	2	....	5	39
Normal	25	90	44	32	20	77	19	15	297	22	17	5	....	4	1	17	66
Per cent retarded	39	48	41	61	61	55	47	....	.....	....	....	....	....	....	....	37	....

In proportion, more children of foreign-born parents were retarded, while the best group proportionately was that of the children with one American parent.

The general impression of poor nourishment, together with a knowledge of the feeding methods of the neighborhood, caused us to give especial attention to weights and heights:

TABLE IV.—*Heights, weights, and chest measurements—Boys.*

Age.	Number.		Mean height (in inches).		Mean weight (in pounds).		Mean chest (in inches).	
	Normal.	Retarded.	Normal.	Retarded.	Normal.	Retarded.	Normal.	Retarded.
7 years	38	1	47.5	45.5	52	45.5	23	22.5
8 years	51	10	49.5	48.5	56	55	23.5	24.5
9 years	50	32	52	51	60.5	59	24.5	24.5
10 years	32	37	54	52.5	69	63	25.5	25
11 years	24	30	55	54	70	68.25	25.75	25
12 years	22	35	57	56	79	75.5	26.25	26
13 years	14	41	59.25	57	87	81	26.75	27
14 years	11	48	62.5	59	102	85.5	28.5	28
15 years	.....	12	.....	61	.....	95	.....	29
16 years	.....	1	.....	65	.....	108	.....	28

TABLE V.—*Heights, weights, and chest measurements—Girls.*

Age.	Number.		Mean height (in inches).		Mean weight (in pounds).		Mean chest (in inches).	
	Normal.	Retarded.	Normal.	Retarded.	Normal.	Retarded.	Normal.	Retarded.
6 years	3	.....	47	.....	47	.....	22.5	.....
7 years	17	1	46.5	45	50	59	22.5	21.5
8 years	49	3	50	51	55.5	55	23.5	23.5
9 years	45	19	51	50	58	62	23.5	23.5
10 years	45	20	54	53.25	69	70	25	24
11 years	18	26	55.75	56	70	75	25.5	25
12 years	20	16	58	57	75.5	88	26.25	26
13 years	20	29	61	59	93.5	90.5	27.5	28
14 years	6	25	64	60	110.5	98	30.5	27.75
15 years	.....	14	.....	62.5	.....	98	.....	28.5

In these tables you will see that the normal boys are noticeably taller and heavier than the retarded, while among the girls of 9, 10, 11, and 12 years the retarded were heavier than the normal.

The children were classed as "well nourished" when they had some color, some muscular tone, showed some alertness, and weighed at least a pound per inch of height. This decision has in it an element of personal equation, for when a child impressed me as being a scrap, it was put in the "poorly nourished" class. One boy fainted from hunger while being examined. An intermediate class of "fairly nourished" accommodated those who had only one or two requirements for the "well-nourished" group. A count of the record of nourishment gave:

TABLE VI.—*Nutrition in relation to retardation.*

	Good and fair.		Poor.
	Number.	Per cent.	Number.
Retarded	261	70	107
Normal	293	74	103

The first thing we found was that the whole group was saturated with tea and coffee, only 42 children being free from these stimulants.

TABLE VII.—*Tea and coffee—Nutrition.*

Good nutrition—263 took tea or coffee one to three times a day.
Fair nutrition—307 took tea or coffee one to three times a day.
Poor nutrition—230 took tea or coffee one to three times a day.

TABLE VIII.—*Tea and coffee: Retarded and normal.*

	Times.				
	0	1	2	3	More.
All retarded	17	27	109	176	71
All normal	26	57	119	150	48

Table VIII shows that the normal children have the best showing in the low amount of coffee taken.

TABLE IX.—*Nutrition in relation to nationality of parents.*

	Both American.	Both parents foreign.							One parent foreign.						
		Bohemian.	German.	Irish.	Lithuanian.	Polish.	Slovac.	Other.	Bohemian.	German.	Irish.	Lithuanian.	Polish.	Slovac.	Other.
Good and fair	43	130	52	59	40	135	24	22	21	21	10	1	3	....	6
Poor	28	44	23	23	13	37	12	5	5	11	7	....	3	....	4
Per cent poor	39	25	30	28	24	21	33	18	19	34	41	....	50	....	40

Table IX gives a distinctly unfavorable impression of the effect of mixed marriages on nutrition with any group except the Bohemian. And the high percentage of Americans poorly nourished simply means that Americans cannot do well in the neighborhood dominated by immigrant wage, and it is the Americans lacking the initiative to get away that stay.

TABLE X.—*Percentage of poorly nourished and of retarded, by nationality.*

	American.	Bohemian.	German.	Irish.	Lithuanian.	Polish.	Slovac.	Other.
Poorly nourished	39	25	30	28	24	21	33	18
Retarded	39	48	41	61	61	55	47	.....

This table does not mean, in its lack of correspondence, that the nourishment should not be improved. It means that these are peasant children, or the children of peasants, and have not yet lost all the vigor of the soil. It was a matter of comment amongst the workers that we could roughly guess the length of time that the child had

been in this country. The absolute relationship between the poor nourishment and the retardation, in the American group, may be a prediction of what will occur when, in another generation, the balance between the child and his environment is really reached.

In the observation of the teeth, always so closely related to nutrition, deformities and abnormalities were not recorded. The figures concern carious teeth:

TABLE XI.—*Carious teeth: Retarded and normal.*

	Number rotten.							Filled.
	None.	1	2	3	4	5	6 or more.	
Normal	52	61	81	68	51	29	59	7
Retarded	91	65	87	60	25	31	31	10

The large number of children under 10 years will in part explain this table, but the whole fact is that only 160 children had teeth free from caries or filled (17 children having teeth that were filled), thus we found 640 children with rotten teeth in their mouths.

TABLE XII.—*Relationship of skin diseases to American birth.*

	American.	Foreign.
Retarded	90	30
Normal	92	10
Total	[a] 182	[b] 40

[a] 27 per cent. [b] 35 per cent.

TABLE XIII.—*Relation of skin disease to American parentage.*

Two parents American	16, or 39 per cent.
One parent American	34, or 32 per cent.
No parent American	168, or 25 per cent.

The most prevalent skin disease was pediculosis, but 14 skin diseases appear in the record, and should be noted because of their relation to truancy, and thus, secondarily, to retardation. Unless the medical department closely cooperates with the compulsory education department they can not do a great deal toward neutralizing each other's work; for instance, if the truant officer rounds up three children, and the nurse or the doctor sends home two of them for contagious skin disease, there is a considerable loss in the work of high-priced employees.

TABLE XIV.—*Enlarged glands, hypertrophied tonsils, adenoids, and anemia.*

	Enlarged glands.	Hypertrophied tonsils.	Adenoids.	Anemia.
400 retarded	349	121	38	170
400 normal	334	156	48	160

These findings are not so evenly balanced as they appear, because we have a larger number of normal children under the age of 11 years, at which age these defects are more common.

TABLE XV.—*Retarded and normal above and below 11 years of age.*

	Up to 11 years.	11 to 15 years, inclusive.	Per cent. above 11 years.
Retarded children	123	277	69.2
Normal children	265	135	33.7

The proportion, if carried out, gives the normals a slight advantage in glands, but only a slight one—22 cases above and below 11 years. Likewise in hypertrophied tonsils the normals have a slight advantage above 11 years of age.

One unexplained superiority of these children is the small number of cases of adenoids. There were only 38 retarded and 48 normal, divided as follows: Retarded, below 11 years of age, 19; 11 to 16, inclusive, 19; normal, below 11 years of age, 28; 11 to 16, inclusive, 20.

TABLE XVI.—*Total number of physical defects of all children.*

	Number of children.	Total defects.	Defects by ages.							
			14 years.	13 years.	12 years.	11 years.	10 years.	9 years.	8 years.	7 years.
Retarded	394	2,555	395	445	321	370	407	368	77	.....
Normal	319	1,967	76	89	218	208	332	412	375	191
Normal in families having retarded	80	549	8	20	39	44	90	113	137	114
Total normal	399	2,516	84	109	257	252	422	525	512	* 305

Average number of defects per child, by ages.

	14	13	12	11	10	9	8
Retarded girls	5.87	6.75	6.63	6.96	7.65	7.47	.....
Normal girls	5.66	5.17	6.53	6.93	6.77	5.98	7.00
Retarded boys	5.54	5.93	6.32	6.53	7.06	7.06	.....
Normal boys	4.20	4.46	5.63	5.38	5.54	7.09	6.20

This table gives the same picture as that given by Ayres, namely, decreasing number of defects with advancing age, thus giving the

retarded children an apparent advantage, as there are more retarded children recorded at the higher ages. It is undoubtedly true that the normals have fewer defects at every age than the retarded; but at no age is the average difference greater than two defects, and, as we shall see later, the handling of these defects counts more than their actual occurrence. This statement is borne out by a control study of 72 normal children in one of Chicago's best residence neighborhoods, where the children were able to make their grades without difficulty, though their average number of defects was almost that of these children.

The figures on anemia were based on the color of the nails and of the inside of the eyelid, but are confirmed by years of practice, in the neighborhood, with many blood counts. Fifty-five to 65 per cent of hemoglobin is the usual finding amongst the children, and may have relation to the smoke—which has a tendency to inhibit normal respiration—to the lack of ventilation in the houses, or to the dry and bad air supplied in the schools. In a former study the average humidity in 15 schoolrooms in one of these schools, taken between 10 and 11 o'clock in the morning, was found to be 41 per cent, exceeding the aridity of Arizona and equaling the drier parts of the Sahara Desert.

The lack of ventilation in the homes is due to the fact that the people live in fear, as well as ignorance and insufficient heat; and they have a basis for this fear in the exploitation that they have to undergo in this country. But the result on the child of the air in his home and in school is disastrous.

Thirty-three per cent of the children showed some enlargement of the thyroid gland, the retarded showing more, while the proportion of boys was larger in small goiters, with 100 boys to 101 girls in the large goiters.

The situation with respect to heart lesions is distinctly bad.

TABLE XVII.—*Heart lesions.*

	Pulse.		Murmurs.	
	Rapid.	Irregular.	Nontransmitted.	Transmitted.
Retarded	35	45	28	70
Normal	49	59	36	74

One acute pericarditis with effusion was found, to which no attention had been given. A call on the doctor in that neighborhood is not a social relaxation, but a stern necessity. Dr. Abt, a man of large experience with this class of children, considers that a real degeneration of the heart muscle occurs in the irregular pulse group,

due to malnutrition. Can not the tea, coffee, and alcohol be also factors?

TABLE XVIII.—*Orthopedic defects.*

	Lateral, slight.	Curvature, marked.	Scoliosis.	Pigeon breast.	Other rickets.	Winged scapulae.
Retarded	46	132	16	15	19	32
Normal	28	145	4	23	55	49

This group of children is not to be benefited by marching up and down a dusty hall to the bang of a piano. If that cherished idea of marching in the school is to be perpetuated, let us be efficient and utilize the power—let us have a treadmill. The curvature was marked in the lower grades, due in part, probably, to the Slavic habit of wrapping the child in the mother's shawl and carrying it always on the same arm.

Ten and eight-tenths per cent gave gross evidence of defective hearing, the retarded children having about 2 per cent the worst of it. Thirty-five children had discharging ears.

The eye findings are of actual inability to see, and are startling enough when viewed from that side, but until we know the nervous strain involved in even the eyesight recorded as normal, we shall be considering an unsolved problem. We can guess at a little of this by the headache; 264 children complained of some headache, while 148 had it frequently and severely.

TABLE XIX.—*Headache.*

	Some headache.	Much headache.
Retarded	96	59
Normal	151	89

Some of the headache undoubtedly is referable to anemia and nasal-abnormalities.

TABLE XX.—*Eye defects (Snellen test chart).*

	Both eyes (20).	One or both (5–10 off).	One or both (15–25 off).	One or both (30 off).
Retarded	67	151	30	58
Normal	76	195	27	51

This table of eye findings corresponds, though with small margins, with the retardation. I have found this to be true in other studies. And if glasses could be afforded, it would be one practical way of

improving not only the nervous balance but the school standing of the child.

The death rate from tuberculosis in this ward is 10 per 10,000 above the average for the whole city, and there are a large number of positive lung findings. "Positive lung findings" in this study means three or more signs of consolidation, while "suspicious lung findings" means one or at most two signs of consolidation, such as prolonged expiration plus increased voice tones. One little girl with pulmonary hemorrhages was in school, and some active, progressive cases were seen in children that looked well nourished. An open-air room with extra nourishment was maintained in one of the schools. It should have accommodated three times the usual number of 25. To make it a necessity to expose a child to, or to inoculate him with, tuberculosis before giving him the air to breathe and the food that he needs puts me in the class of Jane Addams's foreign neighbor, who could not understand why his boy had to steal before he could have a chance to be sent to the farm school.

TABLE XXI.—*Respiratory tract.*

	Nasal obstructions.	Hypertrophied tonsils.	Adenoids.	Lungs.		
				Negative.	Suspicious.	Positive.
Retarded	130	121	38	251	56	93
Normal	146	187	48	257	60	88

Let us now consider the facts available in the school history of these children, their age of starting, kindergarten, transfers, and repeated grades.

TABLE XXII.—*Age of starting.*

Age.	Normal.	Retarded.	Age.	Normal.	Retarded.
4 years	3		8 years	3	10
4½ years	16	17	8½ years	2	36
5 years	10	4	9 years		7
5½ years	49	39	10 years		14
6 years	65	19	11 years		2
6½ years	114	132	12 years		7
7 years	28	24	14 years		1
7½ years	18	55	15 years		1

Part of the retardation with which we are dealing is due to late starting, as shown by the accompanying table (XXII), only five of the normals beginning after 8 years, while 78 retarded children did so. These retarded children are not deficient, any more than their fellows; they simply did not get into step at the beginning, and have suffered ever since. The overloading of the school in the lower

grades, and the inability of so many of the children to graduate from the eighth, give exactly the same results as if they were deficient children. Added to this, the child's lack of good standing must be a bad psychological fact, making him content to scramble along, somehow, in his inferior position.

The repeating of grades shows that both retarded and normal halt at the first grade, then in decreasing, though ever large numbers, they repeat to the sixth, when there is an increase in all the retarded children and in the normal boys. Why is this?

TABLE XXIII.—*Repeated grades.*

	First.	Second.	Third.	Fourth.	Fifth.	Sixth.	Seventh.	Eighth.
Retarded	182	105	80	41	17	31	6	1
Normal	137	28	22	8	1	3	1	1

The pitiful side of this is the table of wasted years (XXIV):

TABLE XXIV.—*Wasted years—Gained years.*

	Retarded girls.	Normal girls.	Retarded boys.	Normal boys.
Years wasted	122.5	78.5	279	76
Years gained	10.5	23	10	24.5
Total years wasted	112	55.5	269	52.5

Over four centuries of effort taken out of the children's lives, and, incidentally, paid for out of the taxes, with no visible result. Or, taken in this way, 12 years' work for one teacher, with a whole grade of 40 children.

Eighty-three retarded children had some kindergarten work, in comparison with 154 normals. Too much stress must not be placed on this influence, though it appears distinctly favorable to the kindergarten. The mother enlightened enough to send the child to kindergarten might have made an environment at home more favorable to normal progress; but, at any rate, the combination worked well in this group.

In a neighborhood with different economic conditions than this, it is well within the scope of the imagination that retardation might be of distinct advantage to certain individuals in the group, because some develop more slowly. But there is no chance for individuation here; the child is like the mail train taking the village mail bag while passing at full speed, he gets his education as he goes through, or he gets it not at all, because the economic situation sends him out to work. This point will be developed in the next section of the study.

Just here we will consider his chance of finishing. This table is based on parental ideals and economic necessity.

TABLE XXV.—*Can the child finish the eighth grade?*

	Yes.	No.	Doubtful.
Retarded	55	216	123
Normal	188	87	216

Another matter to which considerable attention was given was that of transfers. The 400 retarded children had "done time" in 159 parochial schools and in 257 public schools other than the ones in which they were studied: or, each pupil averaged more than two schools. Not only was the retardation caused by differing standards in the schools, but by days and weeks where it was possible to be out of school during the process of transfer. This is due to a poorly worked-out system for keeping track of the child. The normal children had been in 36 parochial schools and 176 public schools, only about every other child having shifted. There are cases, many of them, in which the child leaves school the day he is 14 years of age, whether he has to go to work or not. This, of course, can be attributed to the lack of correlation between the school and the child, either as to his liking and interest, or to his fancied future financial advantage, but the fact is that the larger number will leave school because they must. (See Table XXV.)

Let us now consider the homes, and here we shall find our testimony not quite so evenly balanced. Have they homes? They try to have them.

TABLE XXVI.—*Rents.*

Families.	Rent payers.			Average rent.	
	Girls.	Boys.	Total.	Girls.	Boys.
Retarded	96	141	237	$9.26, including 5 stores.	$9.87, including 2 stores.
Retarded and normal [a]	18	28	36	$10.01, including 1 store.	$20.80, including 2 stores.
Normal	71	94	165	$13.96, including 5 stores.	$13.05, including 11 stores.

[a] "Retarded and normal" means families having children in both groups. The rent will be taken up again to see what it procures for the child.

TABLE XXVII.—*Mortgages.*

	Number.			Amount.		
	Girls.	Boys.	Both.	Girls.	Boys.	Total.
Retarded	30	47	77	$45,550	$94,450	$140,000
Retarded and normal	5	8	13			
Normal	21	48	69	21,650	34,750	56,400

Leaving out of consideration those families having in the list both retarded and normal children—and these should really be counted with the retarded—the normal group should be carrying, for the size of the group, $96,000 in mortgages, to equal the retarded group, instead of the $56,000 they were found to be carrying. Have mortgages anything to do with retardation? Yes; in many ways. First, the burden affects nutrition. One woman said "that $31 a month has to be paid, if we starve." A family in my knowledge, while paying the mortgage, beat the children when their shoes wore out, and the mother, wrongly supposed to be tubercular, quickly gained 25 pounds when circumstances suddenly placed her where she had enough to eat.

The instinct present in all of us to have a home may, when augmented by the fear of nonsupport in old age, become a menace to the child. If we really believe that the home is the best place for a child, the workingman should receive what he produces, in order that the home could be provided without starving the child or sacrificing his education. Getting what he produces, if he works, he might have a home; then, if he does not work, neither shall he eat.

TABLE XXVIII.—*Homes owned free of mortgage.*

Retarded	53
Retarded and normal	21
Normal	109

TABLE XXIX.—*Taxes.*

	Boys and girls.	Tax-payers.	Taxes recorded.	Yearly average tax.	
				Boys.	Girls.
Normal	400	157	104	$27	$34
Retarded	400	133	114	41	34

TABLE XXX.—*Water taxes.*

	Girls.			Boys.		
	Total amount.	Number.	Yearly average.	Total amount.	Number.	Yearly average.
Retarded	$300	30	$10	$911	70	$13
Normal	492	49	10	300	30	10

These tables show that in the group of retarded boys both the property tax and the water tax are considerably higher than in the other groups. This is quite in accord with the Biblical basis of taxation observed elsewhere than in the stockyards district, "To him

that hath shall be given, and from him that hath not shall be taken even that he hath."

Our next consideration is to see what the renter gets for his rent, and the relation of that to the child. The great majority get four rooms, whatever the size of the family.

Average number of living children in the whole group, 4.3 to the family.

Average number of dead children in the whole group, 1.4 to the family.

Families of retarded: Average living children, 4.3; dead children, 1.8.

Families of retarded and normal: Average living children, 5; dead children, 1.5.

Families of normal: Average living children, 2.4; dead children, 1.1.

Total living and dead children by nationality of father.

	American.		Bohemian.		German.		Irish.		Lithuanian.		Pole.		Slovak.		Other.	
	Living.	Dead.	Living.	Dead.	Living.	Dead.	Living.	Dead.	Living.	Dead.	Living.	Dead.	Living.	Dead.	Living.	Dead.
Retarded	117	46	198	53	139	58	167	84	97	38	351	165	35	12	70	26
Retarded-normal.	73	21	140	43	48	15	31	11	14	4	40	9	14	2	12	6
Normal	123	32	196	42	130	43	94	44	48	10	245	66	45	11	104	23

TABLE XXXI.—*Number of rooms in dwelling.*

	1 room.	2 rooms.	3 rooms.	4 rooms.	5 rooms.	6 rooms.	7 rooms.	8 rooms.	9 rooms.	10 rooms.
Retarded	2	8	26	220	56	56	15	6	2	2
Normal			17	166	43	42	16	16	6	8

No up-to-grade child came out of a one or two room tenement. How could he have? One, two, and three room flats in this table produce twice as many retarded as normal children, while eight, nine, and ten room flats house three times as many normal as retarded children. The dark rooms recorded were: Retarded, 177; normal, 152. The use of gas by the family: Retarded, 87; normal, 106. Toilet in the house: Retarded, 99; normal, 95. Bathtubs: Retarded, 50; normal, 57—a total of 107 bathtubs for the group of 800 children, and for the whole group of children and adults concerned of nearly 5,000 people. Among these houses there was only one steam heated, and there were one or two wired for electricity.

TABLE XXXII.—*Families of two or more people to a room.*

	Girls.	Boys.
Retarded	47	70
Normal	26	22

Taking into consideration the number in each group, the retarded boys have more than three times, proportionately, while the retarded girls have not quite twice, the crowding of the normals.

Why do these families with retarded children pay less rent, carry more mortgages, live in fewer rooms, use less gas, have fewer bath-tubs, and declare they will take the children out of school before completing the eighth grade? Because of their incomes, in the main. Of course, shiftnessness, alcohol, sickness and death play their share there as elsewhere, and the neighborhood is cursed with saloons, there being 192 in these two school districts. But the alcohol question has not been gone into in sufficient detail in this study, and just what part it plays we can not say. In regard to death we have:

TABLE XXXIII.—*Children deprived of their parents by death.*

	Step-fathers.	Step-mothers.	Widows.	Wid-owers.	Loss of fathers.	Loss of mothers.	Total.
Retarded	17	11	41	5	58	16	74
Normal	5	8	22	6	27	14	41

Three times as many retarded had lost a father temporarily; two times as many retarded had lost a father permanently.

Apparently the loss of a father, even temporarily, has more effect on school retardation than the loss of a mother, pointing to the relation of income to retardation; for the main and most striking fact in this study, forced upon me in the face of many more apparent causes of retardation, is the income question.

TABLE XXXIVa.—*Income of families having normal children.*

Age.	Under $500.	$501 to $700.	$701 to $900.	$901 to $1,200.	$1,201 to $1,500.	$1,501 to $2,000.	$2,001 to $3,000.	Over $3,000.	Char-ity.	Success-ful; prospe-ous.
14 years	.....	.....	4	3	1	2	1	.....	.....	2
13 years	.....	3	6	5	2	2	.....	.....	.....	10
12 years	3	4	1	10	6	5	.....	.....	1	7
11 years	1	.....	4	6	1	4	2	.....	.....	16
10 years	.....	6	6	11	8	4	.....	1	1	15
9 years	4	6	13	9	7	2	1	.....	2	19
8 years	1	12	8	13	8	3	1	.....	1	11
7 years	1	6	5	3	3	3	.....	.....	.....	6
Total	10	37	47	60	36	25	5	1	5	87

TABLE XXXIVb.—*Income of families having retarded children.*

Age.	Under $500.	$501 to $700.	$701 to $900.	$901 to $1,200.	$1,201 to $1,500.	$1,501 to $2,000.	$2,001 to $3,000.	Over $3,000.	Char-ity.	Success-ful; prosper-ous.
15 years	4	5	3	1	2	1	.....	.....	.....	1
14 years	7	13	15	11	8	3	.....	.....	5	9
13 years	1	22	20	10	4	4	3	.....	4	5
12 years	6	16	16	7	3	6	3	.....	4	4
11 years	9	15	9	6	8	1	.....	.....	9	4
10 years	8	14	10	7	4	3	.....	.....	8	5
9 years	7	9	12	6	4	.....	1	.....	6	8
8 years	4	.....	4	3	.....	1	1	.....	3	.....
Total	46	94	89	51	33	19	8	.....	39	36

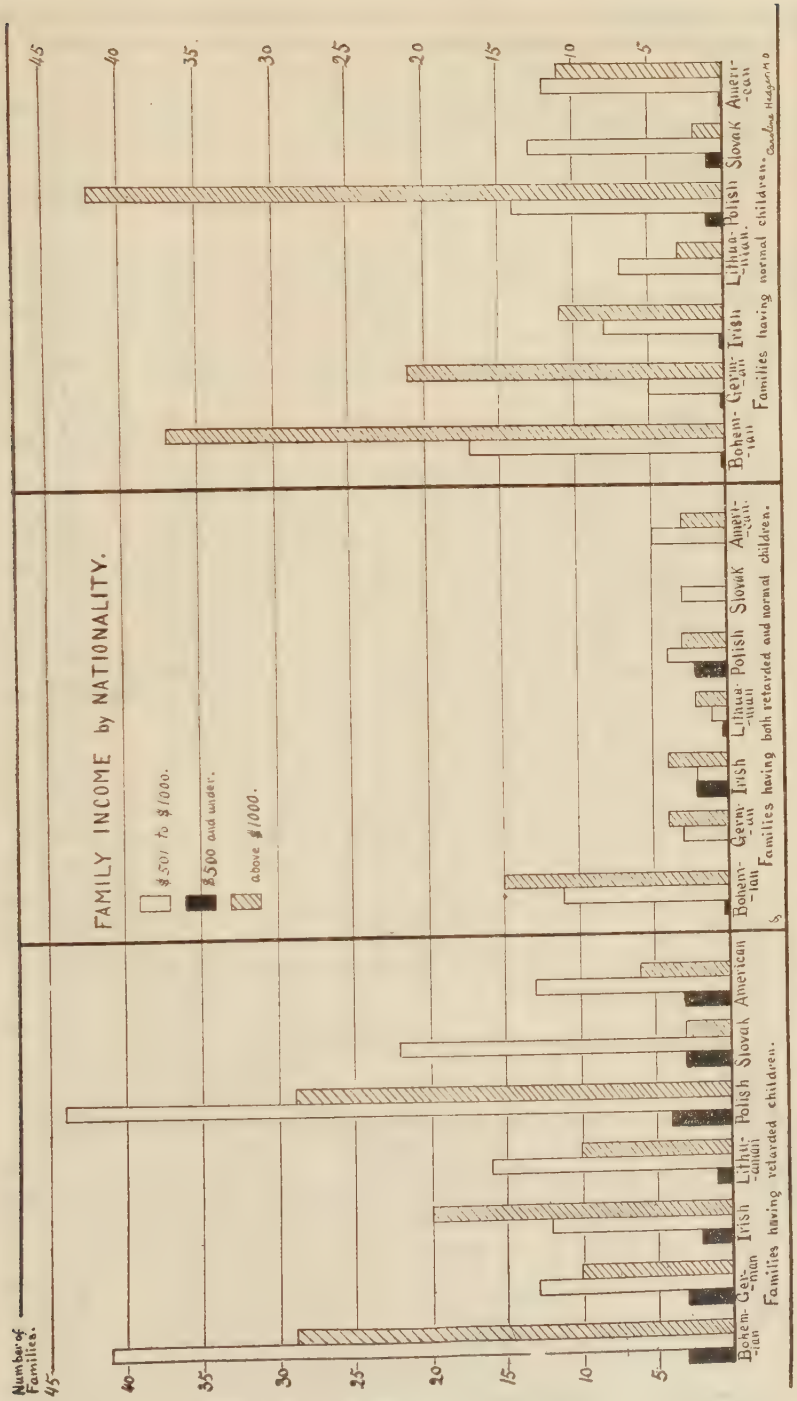
The somewhat detailed study of incomes (Table XXXIV) will explain the situation. Chart I, based on a less detailed classification, shows the same thing in a more striking manner. An income of less than $500 a year does not make up-to-grade children in this group, nor can they be made on that. An income of $500 to $1,000 makes the largest proportion of retarded children in every group but one—the Irish. An income of above $1,000 produces, in every group with two exceptions, the largest proportion of up-to-grade children. These two exceptions are the Slovaks, who apparently have hardly a living wage in their group, and the Americans, who show in all groups a low wage. As explained in the beginning of this paper, the able, successful Americans move to other neighborhoods.

TABLE XXXV.—*Relation of taxation to revenue.* (*The average per cent of income used for taxes, not including street improvements.*)

No.		Age.								
		7 years.	8 years.	9 years.	10 years.	11 years.	12 years.	13 years.	14 years.	15 years
51	Normal girls	2.6	2.4	3.9	3.4	2.6	2.7	2.6	3.7	.....
41	Normal boys	4.2	3.0	4.2	2.9	2.7	2.5	4.4	2.6	.....
31	Retarded girls	.....	1.7	4.6	3.1	4.1	4.8	2.0	3.3	6.8
63	Retarded boys	.....	1.8	5.0	5.7	4.6	3.2	4.0	5.9	3.4

One widow, who still had a little insurance money left to live on, was paying 13 per cent of her income, and only 2 of the whole 186 paid less than 1 per cent of their income, in taxes. The bearing on the child of this attempt to own houses on an inadequate wage can best be illustrated by a story of Miss Montgomery's: An Irish woman who had seen much better days was being called upon by the charity visitor. Her sole surviving splendor was a good green carpet in her front room, and this was, of course, commented upon by the investigator. In telling Miss Montgomery about this interview the Irish woman said: "Ah, shure, what's a bit of green carpet? Ye can naythe ate it nor wear it." And so it is with these mortgaged and outrageously taxed houses. The children can neither eat them nor wear them, but their developing years are pinched and worried, and the physical defects that could be corrected are not, because of the lack of money.

It makes no difference in what way you approach the income question, it tallies with the retardation. Notice, for instance, the curves of Chart II. These curves cover the wages of the fathers in every family of retarded and normal for which we have data. Not only does the wage curve begin lower in the retarded group, but only 30


FAMILY INCOME by NATIONALITY.
$501 to $1000.
$500 and under.
above $1000.
Number of Families.
45
40
35
30
25
20
15
10
5
Families having retarded children.
Families having both retarded and normal children.
Families having normal children.
Bohem-ian
Ger-man
Irish
Lithua-nian
Polish
Slovak
American

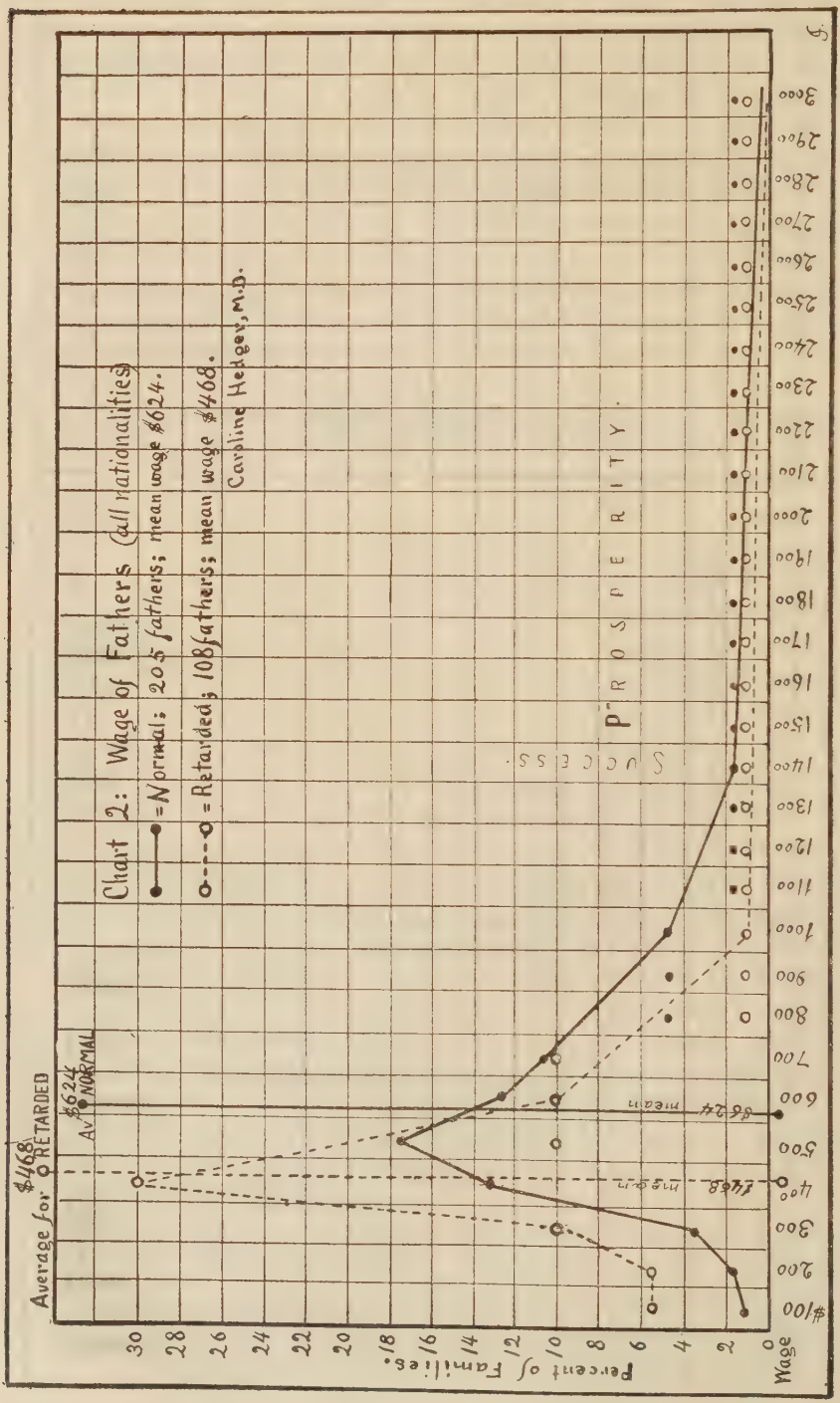
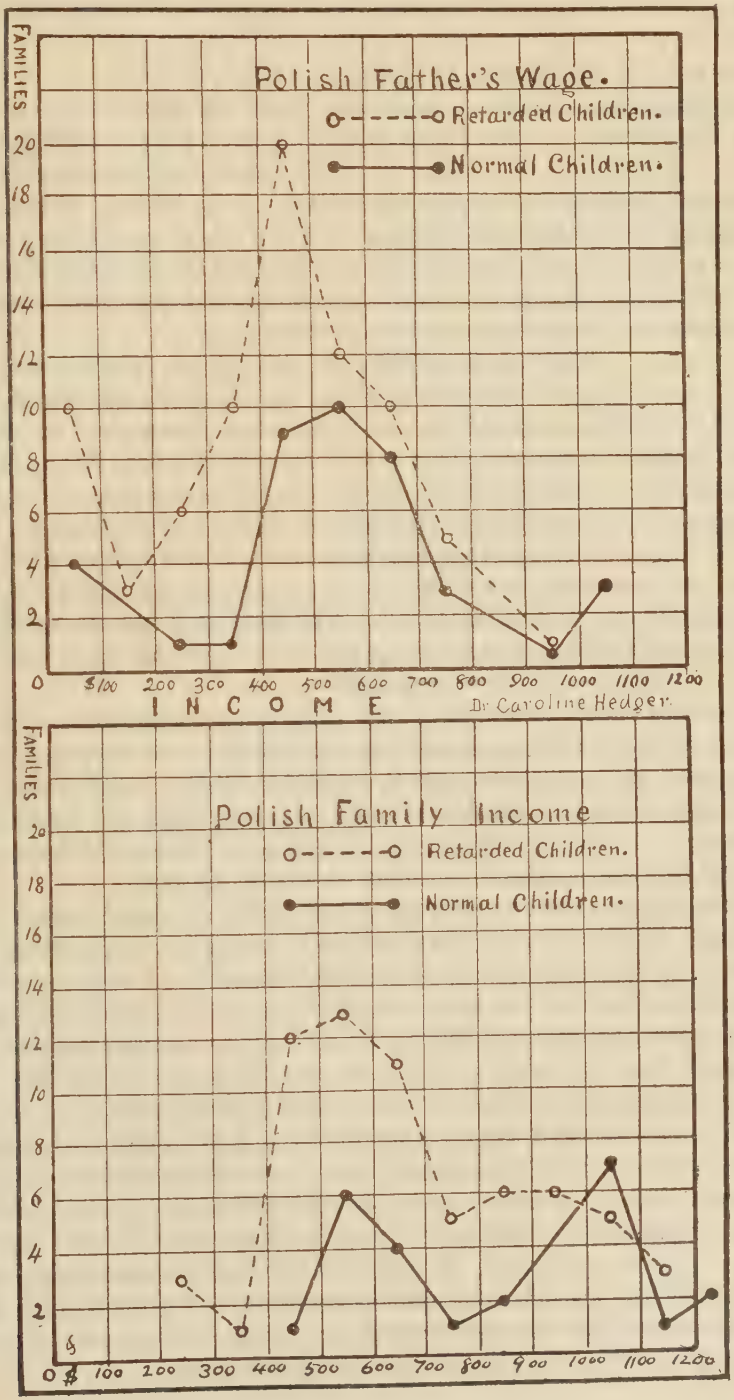


Chart 2: Wage of Fathers (all nationalities)
=Normal; 205 fathers; mean wage $624.
=Retarded; 108 fathers; mean wage $468.
Caroline Hedger, M.D.
Average for $468 RETARDED
Av $624 NORMAL
PROSPERITY
SUCCESS
$624 mean
$468 mean
Percent of Families.
Wage
$100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
2600
2700
2800
2900
3000
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30


Polish Father's Wage.
Retarded Children.
Normal Children.
FAMILIES
0 2 4 6 8 10 12 14 16 18 20
$100 200 300 400 500 600 700 800 900 1000 1100 1200
INCOME
Dr Caroline Hedger.
Polish Family Income
Retarded Children.
Normal Children.
FAMILIES
0 2 4 6 8 10 12 14 16 18 20
$ 100 200 300 400 500 600 700 800 900 1000 1100 1200

men get $780 and above, while in the normal 100 men get $780 or above.

The mean wage of the retarded group father is $468.

The mean wage of the normal group father is $624.

In the curves for the Polish group (Chart III) I wish you to observe that the taxes come out of the children themselves. The difference between the two lines of the same color is the money earned by the mother and children over and above the father's wage, which is shown by the lower line, and when such taxes as are recorded in a previous table are taken out of these incomes they truly must, in part, come out of the labor of the children.

The whole matter of retardation in this group reminds me of a cow I once bought. She was a thin, dispirited, rough, white cow, chased by every member of the herd. I took her home, and all winter long I poured corn and hay into that cavernous cow. Not a pound did she gain, apparently, but in the spring, when the cattle were turned out, there was one awful day of battle, and she emerged the boss of the herd. These children, as a whole, are bad physically, and should be improved, but it is the ones who get enough food, who have more room to live, more chance to sleep in a less crowded bed less worry from taxes and mortgages, that have the spirit and the nervous balance to make their grades.

If to this could be added, in the family, time and money for repairs to teeth, tonsils, eyes, and bent backs; if in the millennium we could add well-ventilated school buildings and a curriculum that had some relation to the individual child, we could aid the natural tendency to overcome defects, and make out of these children, now so handicapped, material of which we should be proud.

If the school ended the career of the child, we could accept with tolerable equanimity the physical condition of these children, but school does not end the story, it only begins it. And if even this meager training for life that we offer the child is curtailed—what then? And if what we offer in the school has so little interest for the child that he leaves at the first possible opportunity, have we any responsibility? Then, if the child grows ineffective, discontented with unskilled labor, idle, criminal, is the child to blame or the smug citizen who lives on the fat returns of stocks, whose money is made for him by the sweat and blood and deprivation of industrial neighborhoods like this? "As a man sows, so shall he also reap;" if you sow greed, 20 per cent on even watered stock, idleness earned by the effort of others, unjust taxation, you shall reap on the other side children like these; later, hooliganism, and increasing problems of dependency and delinquency.

THE MANAGEMENT OF TUBERCULOSIS AMONG SCHOOL CHILDREN.

ARTHUR TRACY CABOT, A. M., M. D., Boston.

Proper measures for the prevention and control of tuberculosis among school children should be addressed not only to the protection of children during their school life and to the cure of those that have active tuberculosis, but should also aim at the education of all children in the essential facts of hygiene and, so far as possible, in the cultivation of habits of living that will protect them in later life.

The present paper does not deal with the educational side of this work, except so far as it is inseparably bound up with the care of children already ailing or actively tuberculous.

The consideration of the best methods of handling tuberculosis demands an appreciation of the habits and characteristics both of the disease and of the patients. At the outset we must remember that if every existent case of tuberculosis could be hunted up and put in quarantine, the practical elimination of the disease could be confidently expected in the lifetime of one generation.

But such thoroughness is, however, humanly impossible. The people would not put up with a quarantine of such dimensions, and it would never be possible to find the cases if the patients feared being shut up.

Many communities are, however, educated to the point of some understanding of the dangers of the disease and the need of reasonable precautions. They are ready to accept a separation of tuberculous school children from well children, and I propose to consider various plans for bringing this about.

The situation is, briefly, that the state insists upon and enforces attendance at school during the growing years of the child, and in so doing it tacitly assumes a responsibility to see to it that the child does not suffer any harm by reason of this school attendance. It is then the duty of the community to safeguard the health of school children as far as lies in its power. This responsibility and this duty are reflected in legislation requiring public schools to conform to certain requirements in building and sanitary arrangements and to provide proper inspection of their pupils in order to protect them from the needless spread of contagious diseases.

Considering these facts, it is obviously necessary for cities and towns to devise some way in which the tuberculous children may be kept from contact with the well.

In approaching this problem the school authorities find themselves confronted by two classes of children: First. Children who are anemic, run down, and undernourished, in whom no signs of tuberculosis can be detected, but whose condition suggests latent tubercu-

losis. The disease appears so frequently in children of this class that they are commonly spoken of as in the pretubercular stage of the disease. Second. Those who are actively tubercular and in whom the disease can be positively diagnosticated.

Children in the first of these classes are not dangerous to other children. They can associate intimately with the well children. They are, however, liable at any time to become actively tuberculous and so dangerous. Life in the open air has proved its usefulness in restoring to health both adults and children who are debilitated, and in many places these children have been provided with out-of-door schools and with open-air rooms.

The out-of-doors treatment of these children is no longer an experiment. It has been fully tried in many places and has abundantly proved its usefulness. These trials have demonstrated that the condition of health is greatly bettered, and have shown that the mental capacity of the children and their ability to learn their lessons is quite surprisingly increased. It has been found that these children in the open air have been found to accomplish their tasks with less hours of study than children in like grades who are studying in closed rooms.

This experience ought to open the eyes of school authorities to their shortcomings in the matter of school ventilation, and the benefits of this discovery should be felt through the whole school system.

In addition to this provision of proper surroundings for these weakling children, it has been not unusual for school committees to supply a lunch and sometimes also to supply warm coverings to needy and scantily clothed children during school hours in cold weather. These are both necessary adjuncts to the treatment of these undernourished children, but the difficulty and expense of providing them has deterred many communities from establishing open-air schools. This food and the extra wraps needed should manifestly be paid for by well-to-do parents, by parents who are able to pay for the medical and other care of their children's health. It is equally certain that they should be supplied to children whose parents are unable to pay for the medical aid they need and who resort, therefore, to dispensaries and public hospitals.

It has been objected that this is a forward step in socialism, and this is undoubtedly true; but is it a valid objection? Compulsory education was a forward step in the same direction, and has the world regretted that? This proposed advance in the care of the children whose education the state has assumed is a measure for the protection of the community, for the improvement of its health, for the limitation of an insidious contagious disease, and, as such, it is a proper measure for which to spend the public money.

The distribution of this help should of course be arranged in such a manner that there should be as little pauperizing effect as possible on the recipients of the community's bounty. It would not be a startling innovation in a community supplying school books to its poor children. To reduce the pauperizing effect to a minimum it might be well, whenever it could possibly be arranged, to have the parents pay a small sum for the lunches.

The children who were given this extra care in the schools would naturally be under the especially careful watch of the school nurses. These nurses would follow them to their homes and would thus have the opportunity to see the home conditions, to discover how they had contributed to bring on the debilitated condition, and to advise the parents and assist them to correct any hygienic mistakes that were being made. The out-of-doors school, then, in order to produce the best results, should be supplemented by a good system of inspection by nurses.

What is an out-of-doors school, and how far does an open window or windows fulfill the necessary conditions?

We find many ventilating engineers who claim that, by carefully adjusted apparatus with forced drafts through apertures whose capacity has been arranged by close calculation, a better quality of air can be provided than by any system of open windows. These claims are based on the supposition that the prime requisite is to supply a calculated amount of unused and fresh air and to remove air that has been used. Their test of the quality of the air in a room is by the determination of the amount of CO_2.

Unfortunately, very little is known as to the characteristics of air which make it wholesome and stimulating. We know that temperature, humidity, and motion have much effect in determining whether air is agreeable and healthful. We know, too, that the amount of CO_2 in air is not an unfailing guide as to its quality in this respect.

Out of the obscurity which clouds this subject of good and bad air one fact emerges with tolerable clearness, and that is that out-of-door air has a healthful quality which confined air never has, no matter how carefully compounded. A man who has been living out of doors notices a stuffiness in the air of a room with all the windows open. There is some quality of freshness and stimulation in the open that is lost in confined spaces. On a summer's evening, after a hot day, compare the air on an open piazza with that inside the house, and consider the length of time it takes for the cool evening air to penetrate and displace the hot stagnant air within a house whose every window is open. By such a comparison as this we shall be convinced that an out-of-door school has advantages over a room with all the windows open, and that we should aim at a thoroughly

out-of-doors arrangement, one which can be protected from violent wind and rain, but the sheltered sides of which shall be fully open.

When the best arrangement cannot be provided, rooms with all of the windows open should be used. Such rooms will be of little use, however, unless they are in charge of teachers who are intelligent advocates of open air, for otherwise the slightest severity of the weather brings a closing of the windows.

The open-air school will act as a strong preventive measure against tuberculosis, and, by improving the health of the undernourished, will check the development of many cases. It will thus cut down the numbers of the other class we have now to consider; namely, the active, "open," contagious class.

It is quite clear that children with open communicable tuberculosis should be separated from the healthy children for two reasons. First, because the State or community is responsible for the reasonable protection of the children whom it forces to attend school; and, with our present knowledge about tuberculosis, it is an almost criminal disregard of this responsibility to allow open tuberculous cases to herd with well children in our school-rooms.

Secondly, these children should be segregated on their own account. They need an even more rigidly carried-out open-air treatment than the debilitated children. They need extra feeding. They need a careful regulation of their work and rest hours, under the guidance of a physician, and the constant care of trained nurses experienced in tuberculosis. They must be carefully taught the precautions needed to prevent their giving the disease to others. In short, they need hospital care and treatment, and their teaching and study must be regarded as of secondary importance.

How can this care and supervision be most effectively and at the same time economically provided?

Here we come to a point in our problem where the human element must be considered. It is quite plain that if all of these children could be collected in hospitals this would give the best sort of isolation of the disease. Unhappily, the parents will not send their children away from home, and without their cooperation this kind of quarantine is impossible.

Facing a problem of this kind, the Boston Association for the Relief and Control of Tuberculosis established an outdoor camp, where the children pursued their studies, and at the same time were under the care of the doctors and nurses in charge of the camp. From this beginning was gradually evolved the Boston Hospital School, which, through the help of the park commission, was comfortably housed in Franklin Park. This experiment proved so successful that the city of Boston, through the combined action of its school board and its Consumptive Hospital trustees, took the school under its charge and

placed the responsibility for its management in the hands of the Boston Consumptive Hospital trustees, thus recognizing that this institution was a hospital rather than a school.

I do not purpose here to consider at any length the detail of treatment at this hospital school. It was practically a day camp at which the children were occupied with study only so far as was thought good for their health. Many parents approved the plan and sent their children. Although situated on the outskirts of the city, the attendance was satisfactory. The children did well. The nurses, trained in tuberculosis work, followed the children to their homes, and were able in this way to exert some influence upon their home surroundings in a manner to obtain for them better care, and to diminish as far as possible the infection of those around them.

An excellent account of the work in this school is contained in a paper published in the Fifth Annual Report of the American Association for the Study and Prevention of Tuberculosis, by Dr. James J. Minot and Miss Hyams. Later, in the Boston Medical and Surgical Journal, August, 1911, Dr. Edwin A. Locke and Dr. Timothy J. Murphy published a very careful study of the work and of its results.

On the 31st of January, 1911, the Boston Consumptives' Hospital trustees closed the school, thus putting an end to this pioneer work which had met with the approval of competent persons in all parts of the country, and which had taken a large number of tuberculosis children out of the public schools and cared for them under conditions which reduced the risk of infection in the community to a minimum.

The chairman of the board, who cast the deciding vote which closed this school, when asked how these patients were to be cared for after the closure of the school, said, "At day camps and hospitals," and declared that it was the intention of his trustees to so provide for them. Under these circumstances it is interesting to know what became of these patients after they were turned out of the hospital school. Drs. Locke and Murphy attempted to find the cases, and were successful in finding 156 out of the 174 cases treated at the school during the year previous to its closure. Of these cases exactly 19, or 10.91 per cent, went to day camps or hospitals; 91, or 58.33 per cent, went back into the public schools; 4, or 2.56 per cent, had died; and the remaining 42 patients, or 26.92 per cent, had gone back into the community.

This gives a striking illustration of the far greater usefulness to the community of a hospital school than of a day camp or hospital. Only a little more than 10 per cent of the children whose parents willingly sent them to a hospital school were afterwards sent to day camps and hospitals. The large proportion of these cases that went back into the public schools, to there infect well children, are suffi-

cient basis for a serious indictment of the city government that subjects well children put under its care to such unnecessary risks. The results of this experience should convince any fair observer that the hospital school is the most efficient means as yet discovered for safely handling tuberculous school children. In a large city several hospitals of this type should be supplied, and so placed as to be accessible to the school population.

SCHOOL INSPECTION.

We have hitherto considered the means at our disposal of caring for the children threatened or affected with tuberculosis after they have been discovered. Obviously, any plan of caring for these children must have its foundation in a thoroughly satisfactory system of school inspection.

It is not proposed here to discuss the details of school inspection, for this must vary according to local conditions. In large cities the task of school inspection is a large one, and since a large proportion of the children belong to a class in the community which does not employ a family physician, school physicians must play a considerable part in any complete scheme. Even, however, in large places it has been found by increasing experience that more and more of the work can safely be delegated to nurses. So far as this work has to do with the early discovery of tuberculous children many experienced physicians, expert in this class of work, feel a greater reliance upon the school nurse for this detection of early cases than upon the school physician. While the final decision as to the existence of tuberculosis must be made by a physician, it is the watchful nurse, constantly among the children, who usually first discovers that the child is out of health and needs attention, and so brings the case to the physician for thorough examination. Many of the cases which come under the head of anemic, debilitated children show no signs, and the close watchfulness of the nurse is more likely to discover children in this class than the cursory observation of a school physician passing his eye rapidly over many children.

In conclusion, then, it appears that a safe system of care for tuberculous children in the schools is a duty that the public assumed when it made school attendance compulsory. That duty the school authorities can not evade, and they should face it squarely.

Any proper plan for handling tuberculosis must rest on a thorough and efficient system of school inspection. Every school should have provision for out-of-door study for all of its debilitated children. These children should have extra feeding. This is a medical necessity of the case. Whether this food should be supplied by the parents, by some outside charitable source, or by the town is a ques-

tion which must be settled according to the circumstances of each case, but the settlement should not be shirked.

Children having active tuberculosis should be separated from the other children and should be cared for as sick children. The most efficient plan for accomplishing this in cities of considerable size is the hospital school, and in a large city these should be divided in different sections of the city, so that the children shall not have far to go from their homes.

KINDERKRANKHEITEN WÄHREND DES SCHULLEBENS.

Prof. Dr. Adolf Baginsky, Friedrich-Wilhelms Universität, Berlin, Germany.

Die Diskussion über die im Schulleben der Kinder vorkommenden Erkrankungsformen, und die daran sich knüpfenden, über den krankmachenden Einfluss des Schullebens selbst, ist so wenig neu, dass man schier kaum begreifen kann, wie dieselbe doch immer noch wieder zum Gegenstand einer Erörterung in fachwissenschaftlichen Kreisen genommen werden kann. Es ist, sollte man meinen so ziemlich alles was über den Gegenstand gesagt werden kann, bereits gesagt, und es wäre, sollte man weiter meinen, besser daran getan, das nun einmal bekannt Gewordene in die Tat überzuführen. Gewiss schreitet mit dem gesamten Fortschritt der wissenschaftlichen Medicin auch die Kenntnis über einzelne Beziehungen zwischen Schule und Krankheitsentwicklung und Krankheitsform vor; auch kann es nicht einmal schwer halten, dieselbe dem sonst erworbenen Fortschritt anzupassen und die Folgerungen weiterhin in die Tat umzusetzen. Somit werde ich auch hier kaum in die Lage kommen können, mit wirklich neuen Tatsachen hervorzutreten, es kann vielmehr meine Angabe nur sein, in einem kurzen Referat den augenblicklichen Stand der Dinge zu kennzeichen.

Wenn Sie, meine Damen und Herren, den im Jahre 1786 erschienenen 2ten Band von Johann Frank's System einer vollständigen medizinischen Polizei—man nannte damals etwa alles das "medicinische Polizei," was wir jetzt unter dem Begriff der öffentlichen Gesundheitspflege zusammenfassen—zur Hand nehmen, so finden Sie ein Kapitel darin von "Schulen und Unterricht der Jugend in Rücksicht auf das Recht der Kinder und des Staates" und hierzu das Motto:

> Ihr lehrt Religion, Ihr lehrt sie Bürgerpflicht,
> Auf Ihres Körpers Wohl und Bildung seht Ihr nicht.

Andere Kapital handeln von der Gesundheitspflege der lernenden Jugend, von zu früher Anspannung der Jugend, von gesunder Bestellung des Schulwesens, von Wiederherstellung der Gymnastik, also

eine Kette von Abhandlungen über Schulhygiene, in welchen auf all die Schäden hingewiesen wird, welche der Jugend während des Schullebens und aus dem fehlerhaft bestellten Schulwesen zu erwachsen vermögen, und wie man aus dem Motto zu erkennen vermag, ist der Autor nicht abgeneigt den Causalnexus beider Vorgänge—Schulleben und Schädigung der Jugend anzuerkennen. Mag man auch immerhin annehmen, dass die damalige Zeit, noch nicht vorgeschritten genug, tatsächlich allen Grund hatte, die Kinder vor der Schädigung durch die Schule zu schützen, so darf doch nicht übersehen werden, dass sich der Kampf um diese Frage durch das ganze 18te Jahrhundert hindurchzieht. In Deutschland insbesondere wo das Schulleben ganz besonders eifrig cultiviert worden war, wo der Schulzwang die Kinder gesetzlich vom Abschluss des 6ten Lebensjahres an in die Schule brachte, und wo in den höheren Schulen durch die verschiedenen Examina, insbesondere durch das umfangreiche und strenge Maturitätsexamen, ohne welches der Zugang zu dem höheren Studien auf die Universitäten und zu höheren Berufen verschlossen war, ist dieser Kampf auf das Lebhafteste geführt worden. Es darf erinnert werden an die schweren Vorwürfe gegen das Schulleben, die von Lorinser in Berlin 1836 erhoben werden, der Störungen der Verdauung und Blutbereitung, Stockungen in den Unterleibsorganen, krumme Haltung und fehlerhafte Beeinflussung der Muskulatur, Kurzsichtigkeit, Verarmung und Abstumpfung des Geistes, Zurückhaltung der naturgemässen Ausbildung des Körpers, dem Schulleben der Kinder als Schuld zuschreibt.

Welche Literatur ist seither herangewachsen! Nehmen Sie mein eigenes Handbuch der Schulhygiene zur Hand, welches in Deutschland in 3. Auflagen erschienen ist, so werden Sie überrascht sein, zu erkennen, wie umfangreich dieselbe ist, die ich allein angebe; dazu nun aber noch die anderen Werke über denselben Gegenstand, in Deutschland von Burgerstein und Netolitzki, von Wehmer, Kotelmann u. A., in England von Dukes, in Frankreich und in Amerika von zahlreichen Autoren mit ihren Literaturverzeichnissen, nehmen Sie dazu die zahlreichen Journale, die denselben Gegenstand behandeln, und "last, but not least," die Publikationen der grossen internationalen Kongresse für Schulgesundheitspflege in Nürnberg, London aus den letzten Jahrzehnten, so übersehen Sie ein überraschend mächtiges Feld von Arbeit und Kampf bis auf den heutigen Tag. Wie aber die Frage im Grossen in diesem Augenblick steht, mögen Sie am besten aus der Tatsache abmessen, dass auf dem letzten, diesem vorangegangenen internationalen Kongresse in Berlin, 1907, in der gleichen Sektion, in welcher wir soeben hier versammelt sind, die Geister in einer der allerwichtigsten Fragen, in der Frage der Ueberarbeitung in der Schule aufeinanderplatzten, indem der eine der Referenten, Czerny, zu dem Ausspruch gelangte, er kenne

aus seiner Erfahrung keinen einzigen Fall, in welchem sich eine Schädigung eines gesunden Kindes durch Ueberarbeitung in der Schule feststellen liesse, vielmehr gehörten alle Kinder, welche angeblich einen solchen Schaden erlitten hätten in die Gruppe der psychopathischen und neuropathischen Kinder, während der französische Conferent Herr Mathieu aus Paris eine grosse Kette von Uebeln, die aus der *malmenage physique* und der *surcharge des horaires de travail intellectuel* hervorgehen, darunter Kopfschmerz, Schlaflosigkeit, Nasenbluten, Anämie, Schwindel, usw. aufzählt, und auch die Discussion nach beiden Richtungen hin ihre Vertreter aufwies. So bleibt also trotz all dem Vorangegangenen und anscheinend Gewonnenem doch nichts übrig, als zu der Frage Stellung zu nehmen.

Sie ist ja augenscheinlich eine zweifache. Einmal die Aufstellung und Beleuchtung der Krankheitsformen, welche während des Schullebens an den Kindern vorkommen und zweitens die Beleuchtung der causalen Beziehungen zwischen Schulleben und Krankheit, falls auch nur ein Verdacht eines solchen Causalnexus aufzukommen vermag.

Die erste der Fragen ist eigentlich, streng genommen, einfach damit zu beantworten, dass von Krankheiten wohl keine einzige vorkommt, welche das kindliche Alter überhaupt zu treffen vermag, die nicht auch in der Zeit des Schullebens auftreten könnte. Also, "during school life," kann das Kind wirklich jedwede Krankheit treffen, und die hauptsächlichsten sind natürlich diejenigen, die wir auch sonst, völlig ausserhalb des Schullebens auch bei Kindern, die noch niemals die Schule kennen gelernt hatten, also bei den Kindern noch wilder und unberührter Naturvölker vorfinden, dazu gehören in erster Reihe die eigentlichen Infektionskrankheiten, wie acute Exantheme, Diphtherie, Keuchhusten, sodann die akuten Erkrankungen der Respirationsorgane, Pneumonien, u. s. w., der Digestionsorgane, wie Diarrhöen von Indigestionen u. s. w., schliesslich auch die chronischen Erkrankungsformen, wie Scrofulose und Tuberkulose. Warum sollten auch gerade die Schulkinder von diesen Krankheiten ausgenommen sein? Die Schule ist doch nicht, und hat garnicht die Aufgabe, eine Schutzvorrichtung gegen Erkrankungen des Kindesalter darzustellen, wenn sie gleich, wie ich dies einmal in einem Vortrage[1] dargetan habe, tatsächlich durch ihre Einrichtungen und durch die physische und moralische Beeinflussung der Schulkinder, dazu beizutragen vermag, auch den Gesundheitszustand der Kinder zu heben und dauernd zu bewahren. Also damit würden wir unserer Aufgabe nicht näher kommen. Augenscheinlich ist es die Erörterung der Möglichkeit von Beziehungen von Schulleben zur Krankheit, mögen dieselben nun engere und nähere, oder fernere nur im Wesen der Dinge gebotene sein, in die wir einzutreten haben.

Wir tun gut bei einer so gestellten Aufgabe denselben Weg einzuschlagen, den wir auch sonst in der Klinik zu gehen gewöhnt sind, wenn wir bemüht sind, über die ätiologischen Faktoren einer uns gegenübertretenden Krankheit zur Klarheit zu kommen, d. i., dass wir der Reihe nach die in die Erscheinung getretenen besonderen Eigenschaften des Milieus studieren, in welchem der Betroffene sich bewegt. Auf das Schulleben angewendet haben wir uns zunächst dem Schulbau, dem Aeusseren, wenn ich sagen soll, der Schule zuzuwenden und hier begegnen wir der Möglichkeit, dass schon Fehler der äusseren Anlage der Schule dazu beitragen können, durch ungesunde Beeinflussung der in der Schule sich aufhaltenden die Gesundheit derselben zu schädigen. Darf man doch nicht vergessen, dass man es bei Kindern im Schullebensalter, also in der Zeit vom 6ten bis 14ten Lebensjahr und etwas darüber, *a priori* mit Organismen zu tun habe, die den Einflüssen des Milieus ganz besonders leicht unterliegen, weil sie augenscheinlich sehr sensibel und empfindlich sind.

Ohne in das Detail der hier einschlägigen Fragen zu dringen, die ja längst in den Büchern über Schulhygiene festgelegt sind, soll immer hervorgehoben werden, dass Fehler des Untergrundes, wie Sumpf oder infizierter Boden, Feuchtigkeit der Wände und Undurchlässigkeit derselben, zu geringe quadratische Abmessung des Raumes für das einzelne Kind, zu geringe Höhe der Räume für die Verhältnisse des nötigen kubischen Raumes. Verfehlung in der Abmessung der Fensteröffnungen im Verhältnis zur quadratischen Bodenfläche und die Beschattung dieser Fenster durch hohe Bäume oder lichtbeschränkende hohe Nachbargebäude, endlich fehlerhafte Heizung- und Ventilationsanlagen, Mängel in Breite und Höhe der Corridore, der Schulhöfe, Mängel an Waschanlagen und Waschgelegenheiten Anlass geben, dass Kinder, die doch täglich mehrere Stunden in solchen Schulen sich aufhalten müssen, schliesslich ebenso Schaden von diesem Aufenthalt haben, wie Arbeiter, die in fehlerhaft gebauten und schlecht gehaltenen Fabrikanlagen tätig zu sein gezwungen sind; des Kindes Arbeitsstätte ist ja eben auch die Schule. Kommt nun noch hinzu, dass auch die Ausstattung der Schulräume verfehlt ist, die Subsellien falsch konstruiert und in Grössenverhältnissen verpasst, dass ihre Aufstellung zweckwidrig ist, so vermag dies noch mehr dazu beizutragen, den Kindern zu Schaden zu sein. Erkrankungsformen der Respirationsorgane, der Muskulatur und des Körpergerüstes, ebenso auch des Sehorganes können, wenigstens theoretisch betrachtet, bei dem langen Aufenthalt der Schulkinder aus so verfehlt gestalteten Schulen hervorgehen.

Den äusseren Schuleinrichtungen sind nun die des inneren Schulbetriebes, des eigentlichen Unterrichts an die Seite zu stellen.

Allzu lange Dauer des Unterrichts, mangelhafte Anwendung und zu geringe Dauer der Schulpausen, die Häufung von Sitz- und Schreibstunden, dazu bei ungeeignetem Druck der Lesebücher und fehlerhaftem schlechten Schreibmaterial, verfehlte Schulpläne, die Häufung des Unterrichts in besonders schwierigen den kindlichen Geist stark in Anspruch nehmenden Gegenständen, vieles Auswendiglernen lassen, harte strenge Behandlung, ungeeignete und selbst schmerzhafte Schulstrafen, Fernhaltung von den regelmässigen Mahlzeiten, übermässig zugemessene Hausarbeiten sind die wichtigsten im inneren Schulbetrieb zur Geltung kommenden Schäden, die an dem Befinden der Kinder sich bemerklich machen. Hier ist es der als Ueberbürdung gekennzeichnete Complex von krankhaften Erscheinungen, der der Schule zugeschrieben wird, und selbst schwere Psychopathieen sind es, deren Ursprung ihr gern als Schuld untergelegt wird. Letzteres freilich, wie hier sogleich hervorgehoben werden muss, zu Unrecht; indess werden hier doch die Anlässe zur Entstehung von Kurzsichtigkeit, fehlerhafter Haltung und Anomalieen der gesamten Entwickelung gesucht.

Als dritter schädigender Faktor endlich kann im Schulleben das notwendig gegebene Beisammensein zahlreicher für Infectionskrankheiten Empfänglicher ätiologisch in Betracht gezogen werden. Naturgemäss wächst mit dem Beisammensein vieler Kinder an sich schon die Gefahr der Contagion, lediglich durch die enge Berührung. Auf diesem Boden des unvermeidlichen so vielfach wiederholten und andauernden Contactes wird die Einschleppung von Contagien zu einer grossen Gefahr, hier wirken die Bacillenträger, selbst anscheinend gesund, und doch die Träger der Krankheiten, als wirksame Erzeuger von Epidemien.

Dies sind in Kurzem Abriss die Verhältnisse, die in Betracht gezogen werden müssen, wenn wir von den Krankheiten der Kinder während des Schullebens im Sinne des Causalnexus zwischen Schule and Krankheit sprechen wollen.

Lassen Sie uns nun in Kürze diejenigen hauptsächlichsten Krankheitsformen ins Auge fassen, welche bis jetzt in der Regel zum Schulleben in Beziehung gebracht werden.

Obenan ein Symptomencomplex der nicht als eigentliche abgegrenzte Erkrankungsform in die Erscheinung tritt, aber unverkennbar zusammengehörig, ein immerhin charakteristisches Krankheitsbild darstellt "die Uebermüdung und Ueberarbeitung."

Blässe des Gesichts, der Haut und Schleimhäute, Welken und Schlaffheit der Muskulatur, Kopfschmerz, Appetitlosigkeit, Erbrechen, Schlaflosigkeit, geistige Abspannung, Zerfahrenheit und Lernunfähigkeit, Unlust und weinerliche Stimmung, Angstgefühl, Unregelmässigkeit des Pulses und Herzklopfen und sonst bei den Kindern ungewohnte Erscheinungen von Unsauberkeit, wie Enuresis

auch eine gewisse Anfälligkeit für acute Krankheiten, wie Anginen und andere Infektionskrankheiten lassen uns in der Gemeinsamkeit ihrer Erscheinung aber unter besonders starkem Hervortreten einzelner der genannten Wandlungen, eine mehr oder weniger rasch hervortretende Minderwertigkeit des physischen und psychischen Wesens der Kinder erkennen. Keine Alterstufe bleibt verschont, schon bei den jüngsten Schulgängern kann sich dieselbe bemerklich machen, ganz augenscheinlich entstanden unter dem Einfluss des mit den strengen Anforderungen von Pflichten, Stillsitzen, Gehorsam, erzwungene Aufmerksamkeit, Fremdartigkeit der Beschäftigung, u. s. w. an das junge Kind herangetretenen Schullebens. Mehr freilich und häufiger sind ältere Kinder die Beteiligten, so besonders die an sich durch die eintretende Pubertät besonders Disponirten, bei denen die von der Natur ins Werk gesetzten physischen Wandlungen sich mit den in Schulpflichten und Schulbelastungen gegebenen Noxen compliciren; so vielleicht am meisten, bei den in den höheren Schulklassen wirklich schwierigeren Anforderungen der Schulpflicht Ausgesetzten, oder bei den gar den Examina gegenüberstehenden Jugendlichen. Gewiss kann man nicht alles der Schule allein als Schuld zuschreiben wollen; gewiss ist das Gros der Kinder von den genannten schweren Beeinflussungen frei und mögen von Hause aus noch andere, in den Kindern selbst schon liegende Anomalien mittätig sein, die genannten Wandlungen zu erzeugen; dies schliesst aber nicht aus, dass dem Schulleben doch ein gut Teil der genannten und aufgezählten Krankheitsvorgängen mit auf Rechnung geschrieben werden muss.

Wer also, wie Czerny dies tun will, nur an Neuropathen oder Psychopathen, den Symptomencomplex der "Ueberarbeitung" (overwork) beobachtet haben will, tut den Kindern und den Eltern Unrecht und macht die Schule in ungerechter, dieselbe bevorzugender Weise, frei von Schuld. Ich selbst habe in dem obern bereits von mir erwähnten Artikel in ausgiebiger Weise hervorgehoben, wie die Schule gewiss nicht alle und die ganze Schuld trifft, und wie die Schule sogar dazu beitragen kann, die Kinder den neuropathischen Anlagen durch geordnete Tätigkeit und Anspannung, durch Regelmässigkeit der Pflichtanforderungen, durch Eingewöhnung an Reinlichkeit, Ordnung und Pflicht, durch Belehrung über allerlei der Jugend drohende Schäden wie beispielsweise den Alkoholgenuss, sexuelle Irrungen, u. s. w. zu entreissen und gesunden Entwickelungen entgegenzuführen; aber die Schule wirklich und völlig frei machen zu wollen von dem Vorwurf der Uebermüdung und Ueberanstrengung der Kinder in dem von mir gekennzeichneten Sinne, heisst das Kind mit dem Bade ausschütten wollen. Ich sehe hierbei sogar völlig ab von den ungemein zahlreichen und geistvollen theoretischen Studien über Uebermüdung mittelst der Mos-

soschen Ergographenversuchen, oder mittelst der ästhesiometrischen Methoden oder den psychischen Arbeitsmethoden, über deren Deutung und Werthung zahlreiche Autoren weit über das Ziel hinausschiessen; wenn diese halb wahr und unrichtig erscheinen so halte ich mich doch lediglich an die einfache Beobachtung des ärztlichen Praktikers. Wer aber aus den eigenen Erlebnissen der Praxis heraus zu urteilen vermag, und genügende Erfahrung hat, wird sich dem nicht verschliessen können, dass es eine wahre und wirkliche Schulüberarbeitung und Uebermüdung giebt, und dass man allen Anlass hat, derselben Aufmerksamkeit zuzuwenden, die Kinder durch geeignete Massnahmen der Entlastung und Entspannung, rechtzeitig denselben zu entreissen.

Die zweite beachtenswerte Anomalie, die im Verlauf des Schullebens bei den Kindern in die Erscheinung tritt und die wir schon seit langem mit demselben in Causalnexus gebracht haben, ist die Myopie. Bis ins erste Decennium des vorigen Jahrhunderts hinein gehen die Beschuldigungen zurück, dass die Schule im Stande sei, Myopie bei den Kindern zu erzeugen, dass schlechte Schulbeleuchtung durch verfehlte Fensteranlagen, viele Lese- und Schreibarbeit an sich schon, durch die Naharbeit, kleine und schlechte Druckschrift, mangelhaftes Lese- und Schreibmaterial, schlechte und dürftige künstliche Beleuchtung die Faktoren sind, welche bei Entstehen der Myopie mitwirken, wenn nicht gar dieselbe wirklich hervorrufen. Ich darf hier erinnern an die bereits im Jahre 1812 von James Ware, der Royal Society of London, gemachten Mitteilung, dass von den in der Zeit von 1803–1807 in Oxford studierenden jungen Leuten 32 Brillen gebrauchen mussten, während unter 10,000 nichtstudierten Soldaten kein einziger Kurzsichtiger war; ich darf erinnern an ähnliche Untersuchungen aus den 40er Jahren in den deutschen Schulen in Baden, Bayern u. s. w., an die Untersuchungen von Szokalski in Paris aus den Jahren 1834–1845 u. s. w.; man findet darüber in meinem Handbuch der Schulhygiene die nötigen Aufzeichnungen.

Eine volle Klarstellung der Verhältnisse fand freilich erst statt durch die ausgedehnten Untersuchungen des deutschen Augenarztes Herrman Cohn, im Jahre 1867, an über 10,000 Schulkindern beobachteten und nachgewiesenen Fällen von Myopie von Schulkindern; und bei der unbedingt vorhandenen Möglichkeit durch angestrengtes und andauerndes Naharbeiten bei schlechter Beleuchtung die Gestalt des Bulbus nach der Richtung der Änderung der brechenden Medien im Sinne der Myopie zu verbilden, is aller Grund vorhanden ist, der Frage auch weiterhin sorgsamste Aufmerksamkeit zu schenken. Dass, zum Glück, die im Schulleben zu tage tretende Form und Grösse der Myopie nicht zu den gefahrdrohenden gehört, dass die eigentlich malignen Myopieformen tatsächlich eine

krankhafte meist erbliche Veranlagung des Auges voraussetzen, kann nicht daran hindern, von den Kindern dennoch alle jene Schädlichkeiten fern halten zu sollen, welche im Verdacht sind, an der Erzeugung der Myopie mitzuwirken. Wir haben allen Grund dazu, unseren Schulkindern viele Sitz- und Schreibarbeit nach Möglichkeit, fern zu halten, die Schulbeleuchtung sowohl in der Gestaltung und Grösse der Fensterflächen, ebenso in der Anordnung der Fenster möglichst günstig zu gestalten, die künstliche Beleuchtung womöglich völlig aus der Schule zu verbannen, indem wir nur die Tagesarbeit nutzen und endlich unseren Kindern durch vieles Bewegen im Freien, im hellen lebendigen Tageslicht störenden Schuleinflüssen zu entreissen. Es wird vielleicht interessieren, dass der Deutsche Kaiser auf das Allerlebhafteste sich der Kenntnisnahme der auch für die Wehrhaftigkeit der Nation so überaus wichtigen Frage zugewandt hat, und mit Nachdruck auf die Bedeutung und Notwendigkeit der Fürsorge für Beseitigung der den Augen der Schulkinder drohenden Schäden hingewiesen hat.

In einem gewissen Zusammenhange mit der Myopiefrage steht eine andere nicht minderwichtige, die Frage der Entwickelung der Skoliose und der anderen Wirbelsäuleverkrümmungen im Alter des Schullebens der Kinder. Die Verkrümmungen der Wirbelsäule hat man ähnlich wie die Myopie in einen ernsten Causalnexus zum Schullebem der Kinder gebracht, so dass man sie als echte Schulkrankheiten zu bezeichnen gewohnt ist. Wer weiss und es kennt, dass sich gewisse anormale Gestaltungen der Wirbelsäule und der Extremitäten an bestimmte Berufsfähigkeiten knüpfen, dass der Tischler eine hohe Schulter, der Bäcker die Beine, der Bureauschreiber den krummen Rücken zur Schau trägt, u. s. w., dem wird nicht verwunderlich sein, dass man auch den Schulberuf der Kinder—denn schliesslich ist doch für eine Reihe von Jahren der Schulbesuch der Beruf der Kinder—mit derartigen Umstaltungen des kindlichen Körpers in Beziehung gebracht hat; und es darf uns um so weniger Wunder nehmen, wenn wir aus den Erfahrungen der am meisten beschäftigten Orthopäden heraus, die Tatsache kennen lernen, das die weitaus grösste Anzahl von Skoliosen, also der schwersten der hier ins Auge gefassten Anomalien im Schulalter entstehen. Wenn Männer wie Karewski unter 756 Fällen von Skoliosen 563 im Alter von 6–15 Jahren, also im Alter des Schullebens haben entstehen sehen, oder wenn Kocher beispielsweise die Skoliose als eine echte Schulkrankheit bezeichnet, so hat man doch wohl Grund genug, der Frage nach der bezeichneten Richtung hin näher zu treten.

Auch die Verkrümmung der Wirbelsäule, die habituelle Kyphose—wir sehen hier selbstverständlich ab von den rachitischen und durch Wirbelcaries entstandenen tuberkulösen Buckelbildungen, hat man mit dem vielen Sitzen und insbesondere mit der Schreibarbeit in

schlechten Schulbänken und bei schlechter Beleuchtung, welche zum Herabbeugen und Näherrücken an Lesebuch und Schreibheft zwingen, in Beziehung gebracht. Und tatsächlich nicht mit Unrecht. Von Hause aus wird niemand leugnen wollen, dass zu all den schlechten Haltungen, die Menschen acquirieren, eine gewisse Disposition vorhanden sein muss, möge nun Erblichkeit oder anderweitig entstandene constitutionelle Anlage die Hauptschuld treffen, so wird doch aus der Erfahrung heraus zugestanden werden müssen, dass unter vielen Hunderten von Kindern, doch nur eine gewisse Anzahl den schädigenden Einflüssen gleichsam unterliegt, während das Gros ungeschädigt daraus hervorgeht, weil ihre Organismen widerstandsfähig genug von Hause aus sind. Dies zugestanden, muss aber doch betont werden, dass im Schulleben hinreichend Anlässe vorhanden sind, die sich als Schädigungen gerade eben bei den Disponierten Geltung verschaffen. Wenn also ein so empfänglich beschaffenes Kind, gezwungen ist täglich Stunden lang in vorgebeugter Haltung, noch dazu in einem schlecht gebautem Subsellium zu arbeiten, und dies Wochen und Monate lang, ja Jahre lang fortgesetzt wird, so darf es nicht Wunder nehmen wenn sich schliesslich eine habituelle Verbiegung der Wirbelsäule herausbildet, die uns als Kyphosenhaltung erscheint und das Kind unschön verändert. Dies kann und wird vielfach ohne eigentliche Verbildung der Wirbelsäule vor sich gehen und dann wohl auch reparabel sein; es kann aber doch vorkommen, dass unter dem Einfluss der stets anomalen Haltung schliesslich bei der noch beträchtlichen Plasticität der Wirbelkörper des Kindes auch durch sogenannten "Druckschwund" der Wirbelkörper, die Zwischenbandscheiben und die übrigen Bandapparate der Wirbelsäule gewisse Aenderungen erleiden, welche eine volle Wiederherstellung zur Norm hindern oder zum mindesten sehr erschweren. Auch die Muskulatur leidet ja bekanntlich unter dem anomalen Gebrauch, hypertrophirt und atrophirt ja auch unter der ihr zugemuteten Arbeitsleistung und Arbeitsentlastung.

Und das, was für die einfache kypothisch falsche Haltung gilt, gilt ja auch mit grösserem Masse, wenn die Kinder durch falsche Art der Beleuchtung, der Schreibhaltung des Heftes, der Art der Schrift und deren Richtung gezwungen wird, dauernd eine fehlerhafte Haltung anzunehmen, weil die Augenaxen nach einer fehlerhaften Richtung hingelenkt und mit diesen die gesamte Körperhaltung fehlerhaft gemacht wird. Die Theorie der Skoliosenentstehung ist bekanntlich nicht minder schwankend wie die der Myopie; die Entstehung der Skoliose ist jedenfalls kein einfacher Vorgang; aber so viel steht zum mindesten fest, dass bei der zur Skoliose führenden Torsion der Wirbelsäule, die ungleiche Belastung ebenfalls unter dem Einflusse des Druckschwundes schliesslich zu dem allerschwersten Verbildungen der Wirbelkörper und der Wirbelfortsätze führt,

allmälich aber auch zur vollen Verbildung der mit den Wirbeln durch Bandapparate verbundenen Rippen; ist doch die durch Ablenkung der Augenaxen eingeleitete und geschaffene Schiefhaltung des Kopfes deren Ausgangspunkt. Der Thorax muss, wenn das Kind bei nach rechts gebogenem Kopfe Buch und Heft fixieren, dem Schreibstift im fortschreitenden Schreiben folgen soll, mit Augen und Kopf die Rechtskrümmung mitmachen und es gelangt so die Thoraxwirbelsäule in die skoliotische Torsionshaltung und Abbiegung. Dauernd geübt, lange festgehalten wird diese Torsion mit Abbiegung schliesslich mehr und mehr habituell. Das Kind verliert das Bewusstsein der Anomalie seiner Haltung und verfällt mehr und mehr in dieselbe, schon unter dem Gefühl der Bequemlichkeit und der Gewohnheit. Allmälich kommt es dann zu perversen Muskelspannungen, welche die falsche Haltung der Wirbelsäule zu fixieren vermögen und zuletzt endlich zu Misstaltungen von Bandapparaten und Knochen. Und all dieses aus den erwähnten Ursachen heraus, freilich wie schon ebenfalls betont, wohl nur bei den disponierten Kindern. Alle früher und bis in die Neuzeit ins Feld geführten Theorien, dass eine von Hause aus gegebene fehlerhafte Anlage der Ossificationskerne der Wirbel selbst, der Bandapparate und der Muskulatur allein, die Ursache der in die Erscheinung tretenden Verkrümmungen seien, müssen den Erfahrungen gegenüber zurücktreten, dass die zu Tage tretenden Anomalien immer den gleichen Charakter der habituellem Kyphose und Skoliose haben, wenn die äusseren Bedingungen immer die Analogien sind. Freilich gehört dazu, dass dieselbe lang dauernd und anhaltig zur Wirkung gelangen. Daher ist das viele langdauernde dann aber stetig wiederholte Schiefsitzen das eigentlich Schuldige im Schulleben, das zu den Anomalien führt; wissen wir doch aus den physiologischen Studien über das Sitzen überhaupt, dass schon das regelmässige Aufrechtsitzen zu Ermüdungen der Muskulatur des Stammes führen muss, weil es nicht möglich ist, ohne active Muskelarbeit aufrecht zu sitzen, wenigstens nicht in sogenannter "vorderer Sitzlage;" aber ohne active Muskelspannungen ist auch die "hintere Sitzlage" nicht möglich, und in letzter Linie führt auch diese zu fehlerhaften Ermüdungshaltungen. Möge es an diesen kurzen Hinweisungen auf die Entstehungsursachen der Skoliose genug sein.

Sie sind jedenfalls hinreichend, ins rechte Licht zu stellen, wie genau ebenso, wie für die Myopie, in derselben Richtung hin Abhilfe zu suchen sei; nämlich dass wir unsere Kinder nicht zuviel, nicht zu lange, nicht zu andauernd die Schulbank drücken lassen, sondern die Sitzarbeit auf das möglichste Mindestmass beschränken, dass wir die Schulpläne danach gestalten, die Schulpausen, die Ferienanordnungen und mit einen Worte den gesamten inneren Schulbetrieb

mit Rücksicht auf die so gekennzeichneten Schädigungen der Schuljugend in möglichst guten Einklang mit den Bedürfnissen der kindlichen Organismen bringen. Gewiss ist die Schule keine Heilanstalt, sondern hat ihre eigenen Aufgaben und Pflichten, die nicht eingeschränkt werden sollen und dürfen; die Schule soll ihr Lehrziel erreichen und erfüllen und soll nicht lediglich von sanitär hygienischen Rücksichten aus eingeengt und behindert werden. Was aber gemeinsam möglich gemacht werden kann, um Schule und Sanitätswesen in ihren gemeinsamen Zielen zu fördern, das soll auch mit Verständnis und gegenseitigem Entgegenkommen geschehen.

Mit den bisherigen Erörterungen ist nun eigentlich im Wesentlichsten derjenigen Anomalien Erwähnung geschehen, die uns im Causalnexus mit dem Schulleben entgegentreten. Von allen übrigen Krankheitsformen lässt sich dies kaum, auch nicht einmal in der Theorie, geschweige aus der praktischen Erfahrung heraus behaupten, wenn anders man nicht künstlich den Causalnexus konstruiren will. Gewiss kommen, wie schon betont, allerlei andere Krankheitsformen auch bei Schulkindern in zahlreichen Fällen zum Vorschein, aber wer wollte wohl, wie das freilich gern geschehen ist, die schweren nervösen Störungen wie Hysterie, Epilepsie, Chorea, Neurasthenie, Psychosen bis zum Selbstmord, der Schule in die Schuhe schieben? Wer die vielfach auch bei Schulkindern zu beobachtenden an der Grenze zwischen Infektionskrankheit und Erkältungskrankheiten stehenden Krankheiten, wie Anginen, Laryngitiden, Brochopneumonien und genuine Pneumonien, Gelenkrheumatismus mit Chorea und obligaten Herzkrankheiten oder die Anomalien des Digestionstractus wie Diarrhöen, Dyspepsien oder gar die immer weiter sich auch in der Schuljugend sich ausbreitende Appendicitis.

Sie alle können hier nur andeutungsweise berührt und gestreift werden. Es wird schwer halten, den Nachweis zu führen, dass nicht Manches, was im Schulleben vorkommt, dazu beizutragen vermag die Affektionen in ihrer Entstehung vorzubereiten und zu befördern, die eigentliche Ursache der Erkrankungsformen wird aber weitab von der Schule zu suchen sein. Die Fälle beispielsweise von Verbreitung von Chorea in den Schulen durch Imitation haben sich der kritischen Prüfung gegenüber als nicht stichhaltig erwiesen, es handelt sich vielmehr immer um hysterische Neurosen bei von Hause aus psychopathisch veranlagten oder durch die durch Unklugheit und Suggestion überregten Kinder; so kann nun freilich auch die überhitzte Schulstube Anlass werden zur Entwickelung von Katarrhen, von Anginen und Pneumonieen, doch wie weit hergeholt ist dies! Es bedarf keiner weiteren Erörterung. Was allenfalls der Erwähnung wert wäre, ist der von vielen Seiten erwähnte sogenannte "Schulkopfschmerz" und auch das Nasenbluten der Kinder.

Beide sind ebenfalls meistens die Folge von zu langem und intensiven Stillsitzen, meist sogar in überhitzten Räumen und überfüllten Schulklassen; sie sind die Folge von Hyperämie der Meningen, ebenso, wie der Nasen- und Rachenschleimhäute und das beste Mittel die Uebel zu beseitigen ist auch hier wieder das Ausspannen für einige Zeit und die Bewegung der Kinder in freier Luft, frei von den Fesseln des Schullebens. In der Regel ist damit in wenigen Tagen dem Uebel ein Ende gemacht.

Wir wenden uns nur noch zwei Gruppen von Krankheitsformen zu, über die Manches der Erwähnung bedarf, der Scrophulose und der Tuberkulose und den eigentlichen akuten Infektionskrankheiten. Ueber die Beziehungen zwischen Scrophulose und Tuberkulose mich hier auszulassen, liegt kein eigentlicher Anlass vor; es genüge darauf hinzuweisen, dass es sich um zwei Schwesterkrankheiten handelt, von denen die eine, die Scrophulose im Stande ist der anderen, gleichsam den Boden vorzubereiten um so, dem Keim zu der anderen dem spezifischen Tuberkelbacillus die Ansiedelung zu erleichtern. Tatsächlich werden die mit der eigenartigen Constitution oder Säfteanomalie behafteten Kinder, welche wir als scrophulös veranlagt bezeichnen müssen, leicht tuberkulös, wenn sie der Infektion mit dem Tuberkulosebacillus ausgesetzt sind, zu derselben sich Gelegenheit findet.

Skrophulose und Tuberkulose der Schulkinder sind bereits lange Zeit, insbesondere aber in dem letzten Jahrzehnt, seitdem man gelernt hat, die Tuberkulose als eine frühe Kinderkrankheit zu erkennen, Gegenstand der aufmerksamsten Beobachtung. Die Tuberkulose ist, wenn man beispielsweise die preussische Statistik zu Grunde legt unter 1,000 Gestorbenen beobachtet worden, im Alter von 5–10 Jahren bei 84.9 Prozent; 10–15 Jahren bei 201.7 Prozent; also in einem sehr hohen Prozentsatz und bei meinen eigenen im Krankenhause gemachten, durch Sektionen kontrollierten also sorgsam gesichteten Beobachtungen stellt sich heraus, dass von 435 an Tuberkulose Verstorbenen im Alter von 6–8 Jahren, 42.6 Prozent; 8–10 Jahren, 28.9 Prozent; 10–12 Jahren, 14.5 Prozent; 12–14 Jahren, 34.6 Prozent standen. In meinem Handbuch der Schulhygiene habe ich bereits betont, dass die Uebertragung des Tuberkelbacillus auf die Kinder in der Schule auf die mannigfachste Weise möglich sei, wenn durch an offener Tuberkulose bereits erkrankten Schulkindern oder Lehrern Tuberkelbacillen verstreut werden. Gerade die durch das Schulsitzen geschaffene ungenügende Atmung ist am ehesten dazu im Stande, die Haftung verstreuter Tuberkelbacillen zu erleichtern und so die Krankheit bei den Schulkindern zum Ausbruch zu bringen; um so mehr dann, wenn auch sonst der Aufenthalt der Kinder im Freien beschränkt ist. Für die Tuberkuloseentwickelung ist also die Schule sicherlich wohl geeignet einen Boden zu schaffen, wenn nicht mit grosser Umsicht

verfahren wird. Darum ist die so segensreiche, von mir schon vor vielen Jahren vorgeschlagene aber erst seit einigen Jahren in einzelnen Städten Deutschlands, voran in Charlottenburg, eingeführte Schule im Walde, im Freien, es sind ferner die Walderholungsstätten mit Schulunterricht, kurz alle die modernen hygienischen Massnahmen und Unternehmungen wie Ferienkolonien, Wandervereine der Schuljugend, als wesentliche Stützen zur Verhütung von Skrophulose und Tuberkulose zu begrüssen.

Was nun endlich die Infektionskrankheiten betrifft, so ist begreiflich, dass bei der Empfänglichkeit der jungen Kinder für die Infektion in dem Zusammensein der Kinder selbst eine gewisse Gefahr liegt, eine Gefahr, die uns um so deutlicher entgegentritt, als wir in der jüngsten Zeit das Augenmerk auf die an sich gesund erscheinenden, aber mit den Keimen der Krankheiten behafteten, als Ueberträger der Infektionskrankheiten gerichtet sehen. Der Einschleppung von Infektionskrankheiten in die Schulen kann unter solchen Verhältnissen nur mit der grössten Vorsicht gesteuert werden und man kann nur billigen, dass Prohibitivmassregeln in den verschiedenen Ländern, besonders ja auch in Amerika geschaffen sind, um die Einschleppung zu verhüten. Freilich wird dies nur immer bis zu einem gewissen Grade gelingen, einmal, weil die Incubationszeit einzelner Krankheiten, wie der Masern, die Infektion bereits wohl, aber die Diagnose der Kinderkrankheit noch nicht gestattet.

Sodann aber auch deshalb, weil es wie beispielsweise für Scharlach kaum eine Grenze der Infektionsfähigkeit gibt, da man völlig vom Scharlach wieder hergestellte Kranke noch nach vielen Wochen die Krankheit verbreiten sieht, ohne dass man im Stande wäre zu sagen, auf welchem Wege die Verbreitung vor sich geht. Freilich kann man, wie beispielsweise bei Diphtherie oder Typhus die Dauerträger von Bacillen füglich nicht ein für alle Mal vom Schulunterricht ausschliessen. So wird immerhin eine gewisse Gefahr der Verbreitung der Infektionskrankheiten durch die Schulen bestehen bleiben, gegen welche man sich freilich durch grosse Sorgsamkeit in der Beobachtung und Untersuchung der Schulkinder, und der ausbrechenden Epidemien gelegentlich durch völligen Schluss der inficierten Schulen wird einigermassen zu schützen vermögen. Begreiflicherweise bedarf es hierzu gut vorgebildeter Männer, der Schulärzte und Schulinspektoren, welchen die Ueberwachung der Schulen anvertraut ist. In Deutschland sind wenigstens für die Volksschulen derartige Funktionäre seit meinen bereits im Jahre 1876 in meinen Handbuch der Schulhygiene gemachten Vorschlägen eingeführt. Im Ganzen wird aber auf der anderen Seite auch die Schule durch die Belehrung über Reinhaltung und Händewaschen und Desinfection an Kindern und Eltern dazu beizutragen vermögen, Epidemieherde einzuschränken, und Epidemien zu löschen.

Meine Damen und Herren: Am Schlusse meiner Ausführungen bin ich mir bewusst nur in ganz flüchtiger Weise das grosse und umfassende Thema, das mir gegeben war, zur Erörterung gebracht zu haben. Wollte ich in die Details der Dinge gehen, so wäre ich Gefahr gelaufen, den zweiten Teil meines Handbuchs für Schulhygiene nochmals zu schreiben, weil dieser im Wesentlichen sich mit all den hier einschlägigen Krankheitsformen "during the school life" befasst. Sollten Sie also mehr Belehrung suchen, als ich in der Lage war in kurzem Abriss Ihnen hier zu geben, so bleibt mir kaum eine andere Wahl als Sie auf dieses Buch, oder auf ähnliche Werke über Schulhygiene zu verweisen.

SCHLUSSSÄTZE.

1. Wenn man gleich nicht von "Schulkrankheiten" in dem Sinne sprechen kann, wie man von "Berufskrankheiten" spricht, so muss doch zugegeben werden, dass unter dem Einfluss des Schullebens bei Kindern eine Reihe von Krankheiten vorkommt, die beobachtenswert sind.

2. Es giebt einen Symptomencomplex, welcher als "Uebermüdung" oder "Ueberarbeitung (overwork)" bezeichnet werden muss und unter dem Einfluss der Schulleistungen entsteht, und es ist nicht richtig Alles, was in diesem Symptomencomplex zur Beobachtung gelangt, lediglich auf congenitale oder anderweitig erworbene Neurasthenie oder Psychopathie der Kinder zurückführen zu wollen.

3. Die Myopie, welche sich im Schulleben der Kinder entwickelt, ist keine bösartige (maligne) Form der Augenanomalie, sie ist aber doch recht beachtenswert und kann durch gute Schuleinrichtungen, wie auch durch gute Gestaltung des Schulunterrichts auf einen geringen Grad des Vorkommens, reduciert werden.

4. Die Wirbelsäulenverkrümmungen, welche sich im Schulalter entwickeln, sind lediglich die Folge zu vieler Sitzarbeit und insbesondere der zu ausgedehnten Schreibarbeit der Kinder. Die Verbesserung der Methoden des Unterrichts und der Schulpläne kann dazu beitragen die Erkrankung aufzuhalten.

5. Es ist ungerechtfertigt eine grosse Anzahl von Krankheiten, die sonst im kindlichen Alter zur Beobachtung kommen, mit dem Schulleben in Beziehung zu bringen.

6. Gegen die Infektionskrankheiten, auch gegen Tuberkulose, vermag eine sorgsame hygienische Ueberwachung der Schule durch Schulärzte und hygienisch ausgebildete Schulinspektoren einen relativen Schutz zu schaffen; notwendig hierzu ist überdies die Verbreitung hygienischer Kenntnisse im Volke selbst.

[1] Baginsky: Die Schule im Dienst der öffentlichen Gesundheitspflege. Vortrag d. 24. Oktober 1905 in Berlin Verein für Schulgesundheitspflege. Druck von L. Schumacher.

MENTAL HYGIENE IN THE SCHOOL.

Dr. WILLIAM H. BURNHAM, Professor of Pedagogy and School Hygiene, Clark University, Worcester, Mass.

During the last 25 years the hygienic conditions of almost every industrial occupation have been studied. It is not strange, perhaps, but rather in accordance with the natural evolution of science, that the occupation of the brain worker, especially in the public schools, should be among the last to receive such special investigation. It was only a little more than 20 years ago at the London Congress of Hygiene and Demography, 1891, that Burgerstein reported his classic investigation on the curve of work for a school period of one hour. And it was only four years ago that the first book (Huey's) on the psychology, pedagogy, and hygiene of reading was published.

The importance of the subject, however, which is suggested by the fact that in this country alone some 18,000,000 of children are engaged in school occupations during a large part of the year, has been recognized, and many scientific studies relating to it have recently been made.

We are coming to see that the mental condition, or mental environment—a subtle but definite thing we attempt to describe by such words as mood, temperament, emotional type, mental attitude, sthenic index, Einstellung—is quite as important for the health and efficiency of the individual as the external environment. This mental environment, as we have called it, conditions not only the nervous and mental activity, but also, in an important way, digestion, secretion, and the trophic functions in general. Both directly and indirectly it affects the mental health. All this, however, is vague and indefinite. It suggests, perhaps, all sorts of fads and vagaries; and, in the minds of many people, the whole subject of mental hygiene means merely a mixture of whims, superstitions, mystical formulæ, and occult processes. Modern studies of the brain and mind, however, have yielded results that have at least formed a solid foundation for a scientific mental hygiene.

The chief results have come from four sources: (1) The physiological studies of the conditions of intellectual activity and feeling—a long series of investigations from Mosso's early work on the cerebral conditions of mental activity, to the recent studies by Cannon and others of the correlation of adrenal secretion and feeling; (2) recent studies in psychiatry; (3) recent experimental studies in psychology and pedagogy; and (4) recent genetic studies, of physiological and psychological age, and the like, among school children and defectives. On these results, which there is not time to mention here, a new application of hygiene, the hygiene of instruction, has developed.

Mental hygiene has clearly stated the problem of the hygiene of instruction, and it challenges every subject of instruction, every method and device, and even every pedagogical principle. It emphasizes the fact that, besides the direct pedagogical results of the study of any subject, there are also certain secondary results, and it notes the significance of these for health. Many examples of such secondary results might be cited; habits, attitudes, neuroses, arrests, important both for efficiency and health.

Efficiency in mental activity at any given time depends upon many conditions both physiological and psychological. Among the former, are physiological age, the blood supply to the brain, as determined by the general nutrition; the size of the cerebral arteries, exercise, posture, etc.; the quality of the blood, as determined by food, drugs, oxygen supply, etc.; the condition of the tissues and metabolism, as determined by the environment, temperature, humidity, barometric pressure, light, peripheral stimulation, etc. Among the latter the psychological conditions are the feeling tone, as determined by the condition of the nerve centers, internal secretions, etc.; habits of work, of sleep, of attention, interest and association, and self-control, reaction to feeling, etc.

To attempt to determine the conditions of healthful mental activity is an exceedingly complex problem; but here psychology comes to our aid and, while noting the extreme complexity of the psychic processes in the active, thinking individual, it shows certain unifying laws and suggests the fundamental principles of a sound mental hygiene. Some of these may be formulated tentatively, and in the briefest and most general way, as follows:

1. Perhaps the most primitive and fundamental mental function is attention. It has aptly been compared to the tropisms in plants and animals. While structurally it means clearness, genetically and functionally it means a reaction of the organism comparable to the tropisms. The most primitive and natural form of attention is a reaction to certain immediate stimuli, to the present situation. The type of healthful attention everywhere is attention to the present situation. The ability to concentrate on the present, forgetting the past, except so far as vitally related to the present and ignoring the future except as it forms a part of the present is so important for the mental health that the degree in which one can concentrate upon the present is a test of mental health and sanity.

In case of children, especially, the normal mental attitude is that of attention to the present situation. We all know how quickly the emotions of childhood pass, how brief are the child's sorrows, how few its anxieties, unless there is some abnormal training or chronic pathological neurosis. In other words, the carelessness of children that we complain of is usually one of the marks of sanity. Clouston,

in his "Neuroses of development," notes the reverse of this as one of the symptoms which may lead one to anticipate adolescent insanity.

2. The second fundamental thing in psychology is the law of association, a law in the mental world comparable, as pointed out by Zanotti and Hume, to the law of gravitation in the physical world. The corresponding principle of mental hygiene is the need of orderly association in our thinking for the integrity of the mental health. Conversely, perhaps the most general term for whatever menaces the mental health is, in psychological words, interference of association. What is meant might be illustrated by innumerable experiences of everyday life.

Many people are never straightforward and orderly in their processes of thought. They are always thinking of two things at once; or, if one subject holds the focus of attention, other things are in the background or indirect field of consciousness, and liable always to interfere and cause distraction.

All of us at times experience this: Waiting for an important engagement, a forgotten duty, uncertainty about a verdict, unfaithfulness to an ideal, and the like, are occasions for it; and every individual in the stress of circumstance, from the collapsing financier to the rattled baseball player, furnishes illustration.

Many laboratory experiments, especially those on the acquisition of skill, and those by the so-called Diagnostische Assoziationsmethode, give noteworthy examples.

In normal subjects, the association reaction time is usually pretty uniform; only occasionally is there a disturbance which causes a lengthening of the time. In case of abnormal subjects, the response is frequently delayed so that the curves representing the association reaction times are irregular. Again, it is found that in normal persons, in the case of emotional disturbances, the association reaction time is likely to be lengthened. If a person has committed a theft, associations connected with that show an abnormal reaction time. Again, in cases of hysterical disorder caused perhaps by psychic shock, or the like, associations connected with the disturbing complex of ideas show a greatly lengthened reaction time. Especially significant is the fact that associations connected with one's own family, wherever any unnatural or abnormal conditions exist, are likely to show lengthened time. From perhaps a normal reaction time of one or two seconds, sometimes the time is lengthened to four, or six, or ten, or more seconds.

The great waste that results from such interference of association is shown first by this great loss of time. In all cases where the reaction is thus retarded by feeling, we have pretty clearly interference of association. And, on the other hand, interference of association is pretty sure to be correlated with feeling.

The extreme form of interference of association and worry is well illustrated by the so-called obsessions. These are in great variety, from obsessions in regard to one's physical health or one's soul's salvation, to the slight temporary obsessions where a nonsense rhyme or an absurd image persists in consciousness. They may refer to the past or to the future, and, whatever their content, they seem to be abnormal. Apparently, if one gets into the habit of such obsessions, whether from ill health or bad training, the victim is bound to have them in some form or another. Thus we often notice persons who must always have something to worry about. If it is not one thing, it is something else.

Wherever such interference of association occurs, especially if, as is usually the case, feeling is also present, we have an incipient form of worry, and this, in any form, is injurious to the mental health. Hence, in all methods of teaching, and in the whole hygiene of instruction, care must be taken to avoid confusion or interference of association.

That orderly association is a matter of temperament, nervous condition, and training is shown by the fact that it is not dependent on the external environment, but rather on what may be called the mental situation or mental environment. The modern man often works with concentration and without interference of association under apparently most distracting circumstances, and what is distracting to one individual is not necessarily so to another. I know a man, for example, who often can do his best work, working naturally and without interference of association, while riding in the steam cars, or listening to the clicking of a telegraph instrument, or at a vaudeville performance; in fact, almost anywhere, in spite of what would seem distracting sights and sounds, provided he feels no responsibility in regard to them. But this same individual, being imperfectly trained, is often the victim of interference of association while working in his own office, because of the feeling of responsibility for many duties.

Interference of association is not likely to occur in a child's spontaneous mental activity. It is only when we attempt to develop the so-called power of voluntary attention, which is really imperfect attention, that interference occurs. Under present conditions, with the lock step of the drill squad, with the wasted years of the retarded children, the pupils are sure to leave the schools with bad habits of attention and disorderly association. The schools might give a training that would prepare for the activities of life by developing healthful habits.

3. The third great principle of mental hygiene is that of normal reaction to feeling and emotion. The tremendous importance of the emotional life to the mental health has now been recognized; but

only recently have the subtle, far-reaching effects of abnormal repression of feeling been shown. Repression of an emotional impulse to react disorganizes, disintegrates, and demoralizes. The repressed emotion must find an outlet in some way. All sorts of bizarre and abnormal expressions of feeling are reported by scientific observers in psychiatry.

Now, there are two general forms of reaction to feeling, the obvious natural physical reaction, on the one hand, and a secondary associated psychic reaction on the other. Within certain limits, both are natural and normal, as is made clear by many examples. For example, if my neighbor insults me without provocation, a natural form of reaction may be to knock him down; or I may philosophize about it, and disdain to resort to violence; and this mental reaction may be just as normal as the physical expression of feeling. Thus the man who has many interests and many mental attitudes, as we may call them, that of the philosopher, the humorist, the psychologist, the philanthropist, and the like, has so many possible means of self-control and of normal reaction to feeling.

The work of education, culture, and morals, is largely to train to these habits of secondary associated reaction on occasion of emotionally exciting situations. In all the social experiences of the school, large opportunity occurs for developing habits both of health and of morals.

4. The fourth fundamental principle of mental hygiene is the proper alternation of periods of work and of rest. According to some hygienists, this is the most important principle of nervous and mental hygiene, and both the work and the rest are essential conditions of health. We are not lacking for a solution of our problem by reducing our mental activity, or by making it less intense, or by cutting down the expenditure of energy. Function, work, the explosion of energy, seem to be the condition of health everywhere. Work is a condition essential to rest as well as rest is a condition of work. Here should be considered the results of 25 years of investigation of fatigue; and recent studies of efficiency in the industrial world have shown this need of a proper alternation of work and rest; the principles of so-called scientific management are substantially the principles enunciated by scientific physiology and psychology 20 years ago; but the ordinary man is more ready to accept these principles, when stated in terms of pig iron lifted, than when applied to the operations of the counting room or the study. Alternation of work and rest is absolutely essential for both health and efficiency; but the most important applications of this principle are probably seen in the ebb and flow of normal attention when one works naturally and spontaneously in a subject in which one is

interested, and in the proper balance between an individual's strength and the demands of one's environment.

There is not time to speak in detail of the errors of the school in regard to mental hygiene—methods that produce erroneous associations, the undue haste in requiring quick answers when a child's association reaction time is several seconds longer than that of the adult, the methods of repression that lead to inhibition of the will, and the like—but perhaps the one most serious fault of the school may be put in a general way by saying that it is apt to give work prematurely, or by a wrong method, and to discourage and depress, when both hygiene and pedagogy demand success, confidence, and cheerfulness.

A false pedagogy, built up on a superficial and obscure, but now largely obsolete psychology, is to blame for many unwise practices in the schools. We have exalted the value of doing disagreeable things in education, of exercising the so-called voluntary but really imperfect attention, of doing important things at as early an age as possible, or remedying nature's defects by an all-around symmetrical training, and, in general, the advantage of doing what children do not like and are not well fitted to do. How common this practice is everybody knows. An account of what would seem to be the earliest historic attempt at this method of training will be sufficient for illustration. I quote the report of Prof. Dolbear:

> In antediluvian times, while the animal kingdom was being differentiated into swimmers, climbers, runners, and fliers, there was a school for the development of the animals.
>
> The theory of the school was that the best animals should be able to do one thing as well as another.
>
> If there was in a given animal an apparent aptitude for doing one thing and an apparent inaptitude for doing other things, the time and effort should be spent upon the latter rather than on the former.
>
> If an animal had short legs and good wings, attention should be devoted to running, so as to even up the qualities as far as possible.
>
> So the duck was kept waddling instead of swimming. The pelican was kept wagging his short wings in the attempt to fly. The eagle was made to run, and allowed to fly only for recreation; while maturing tadpoles were unmercifully guyed for being neither one thing nor another.
>
> All this in the name of education. Nature was not to be trusted, for individuals should be symmetrically developed and similar, for their own welfare as well as for the welfare of the community.
>
> The animals that would not submit to such training, but persisted in developing the best gifts they had, were dishonored and humiliated in many ways. They were stigmatized as being narrowminded and specialists, and special difficulties were placed in their way when they attempted to ignore the theory of education recognized in the school.
>
> No one was allowed to graduate from the school unless he could climb, swim, run, and fly at certain prescribed rates; so it happened that the time wasted by the duck in the attempt to run had so hindered him from swimming that his swimming muscles had atrophied and he was hardly able to swim at all,

and in addition he had been scolded, punished, and illtreated in many ways so as to make his life a burden. He left school humiliated, and the ornithorhynchus could beat him both running and swimming. Indeed, the latter was awarded a prize in two departments.

The eagle could make no headway in climbing to the top of a tree, and although he showed he could get there just the same, the performance was counted a demerit, since it had not been done in the prescribed way.

An abnormal eel with large pectoral fins proved he could run, swim, climb trees, and fly a little. He was made valedictorian.

Ever since that day the opinion has grown that the school must reform children.

By all means let us reform children if we know how; but, in order to do so hygienically and morally, we must study the individual—physiological and psychological age, capabilities, habits, attitudes, and affective conditions of euphoria, dysphoria, and the like. Where we lack knowledge it is well to let the matter alone. The importance of working spontaneously and with joy and success is emphasized by experimental studies of the learning process.

Dr. Book, for example, in the laboratory of experimental psychology at Clark University, studied the development of skill in the use of the typewriter. On the basis of this research he reports as follows:

It is not what the learner would like to do, but what his mental and physical condition at the time of study or practice will let him do, that is important for determining his progress. The most economic learning would seem to demand that the learner work only when he can enjoy it and succeed—and to wait until he can.

Let no one make the mistake of supposing that the aim of school hygiene is to make school work easy. On the contrary the aim is so to improve conditions that it can be made hard and that the pleasure that comes from intense and successful effort may be possible.

Such are some of the fundamental principles on which a sound hygiene of instruction must be based. The subject in its practical applications, however, can be built up only by careful experimental studies by many investigators, but the subject already has a definite basis, a definite aim, a set of definite problems, and is now devising methods of investigation. The results already obtained are not spectacular, but they are important. They can not be presented without enumerating a mass of details, most of which have been condensed by Burgerstein into some 400 pages in the second edition of his Handbuch. But the great result is the new attitude toward the work of school instruction, an hygienic apperception, if you please, which does not ignore the secondary results of instruction and regards all educational processes from the hygienic point of view.

No one who reflects upon the fact that the patients in our hospitals and sanitariums were a few years ago pupils in the public schools,

and on the further fact that in the schools, from four to six hours a day, five days in the week, for the period from six to fourteen or later, the children are engaged in brain work, in forming habits of attention or inattention, orderly or disorderly association, and developing interests healthful or unhealthful, can fail to see the significance of all this for hygiene. In fact, the very aim of the school is to develop certain permanent interests. If the school is successful in this, it means the acquisition of certain permanent habits of orderly association, but, unfortunately, it often sadly fails in this.

In the latter half of the last century a vast deal was written by physicians about overpressure and injury to health in the schools. A good deal of overpressure still exists in some places, but it is not my purpose now to lay stress on this. The charge against the school by the modern hygiene of instruction is not so much that the school directly injures the health of the children, but rather that it neglects the opportunity to foster health. Healthful habits of mental activity are not developed, and the pupils have to be reeducated in the reformatory, the hospital, and the sanitarium.

Parents and teachers alike are dissatisfied with the work of the school. They are wont to think lightly of what is gained in the way of conventional knowledge, but habits of mental health and efficiency, such as have been described, would be of inestimable value. Thus it is not without reason that students of education are beginning to demand a thorough reorganization of our schools on the basis of somatic and mental hygiene and genetic and experimental pedagogy.

STUDIES IN THE RELATION OF PHYSICAL INABILITY AND MENTAL DEFICIENCY TO THE BODY SOCIAL.

ISABELLE THOMPSON SMART, M. D., Medical Examiner Mentally Defective Children to the Department of Education of the City of New York.

Emerson once said that "Nothing great was ever achieved without enthusiasm" and perhaps we have here the crux of our problem for the care and training of the mental defective. Certainly, up to within a very short time ago there was no very definite or marked enthusiasm over either the physical or mental qualifications of the ament. The less said about this class of society the better pleased people seemed to be, and, as for our lawmakers and those whose duty it was to make adequate provision for these unfortunates and protect them by the much vaunted "strong arm of the law," they have time and again turned a deaf ear to any plea which was made in their behalf, and we are now reaping in a large harvest of shame and crime as a just reward for the general ignorance and neglect of them.

I have chosen, somewhat at random, a group of 10,000 cases which have been presented to me for medical examination, to determine their physical and mental fitness for the work required of them in the school grades. In every instance the child had fallen behind others of his or her age and grade and had continued to retrogress for some terms. In every instance I found positive physical defects, and, with many, combination of physical unfitness with a serious mental defect, which demanded a proper segregation of the case in question. Ofttimes the improvable cases had become discouraged because of the ever constant inability to cope with the tasks set by the curriculum, discouragement when the little brother or sister, perhaps years younger than our weakling, was able to reach the same grade with our defective and in a term pass ahead to a higher grade, receiving the praise of parents and teachers, while our unfortunate received the odium and berating which he should never have been called upon to bear. To-day the outlook for such a child is a little more favorable, for the sleepiest teachers now have had borne in upon them the fact that there are children who are wholly incapable of doing grade work, and that very many are unable to do even the manual work.

Ten thousand cases! Ten thousand little human beings so seriously handicapped that they will never be able to enter fully into competition in order to earn a livelihood—so seriously handicapped that the major number should be segregated, and marriage and procreation be absolutely denied them.

The greater number of the physical defects could be very much bettered—many of them cured—but the mental unfitness is irreparable. Up to a certain point, all of these cases could be trained to become useful units in a colony life, suited to their individual needs and under proper supervision; but if left to drift, after their brief term of school life ends, will in large measure become derelicts, and will, in time, fill our penal institutions and our homes for fallen women; or worse, live at large and procreate their kind in large numbers.

Not a single low-grade case of imbecility or idiocy has been included in the number of cases presented; all would fall within the limits of middle grade and morons.

All of the low-grade cases of iodiocy, imbecility, and Mongolianism should, without any question, be placed where they may be protected from society and from themselves; but the number is so great in the city and State of New York that adequate provision is, at present, and for some years to come, entirely out of the question.

I made an attempt to get at the facts of the housing problem in the State a few weeks ago. We have a number of good, well-equipped institutions located at Rome, Syracuse, Newark, and a fine new colony under construction at Thiells, known as the Letchworth Village, having something over 2,000 acres of the finest farming land, or-

chards, gardens, and the like, in the beautiful and fertile valley of the Hudson River. This was set aside by the State two or three years ago. We have also one of the best-known colonies for epileptics—the Craig Colony, at Sonyea. Yet in every instance, in answer to my query: "Have you a waiting list?" the reply was: "Yes, * * * anywhere from 400 to 850," whose names are listed and who have no chance of entering unless death claims some of the present inmates or we have new buildings and increased facilities. We have a sufficient number of mental derelicts in our New York City schools to practically refill these State institutions at this minute, and the end is not yet, and one wonders what the outcome is to be. Our daily press tells us that "on an average one murder a day is committed in our city," and I am convinced that this number will be increased within the next few years unless we are able to secure some pointed and drastic legislation which will enable us to care for the cases we now know to be feeble-minded.

This past summer has been one of the most appalling tragedy; innocent little girls, who were mentally bright, have been decoyed from their homes, and then made the victims of the most horrible assaults and left to die in a manner which makes the blood in one's veins congeal. Several cases of this character have been recorded—the most awful was perhaps that of little Julia Connors, of the Borough of Bronx—fiendishly assaulted, her body horribly mutilated; she was then left to die, by a lad in his teens, who had been serving a term because of another and similar assault on another little girl, a lad known to be of defective mentality, who was, at this time, out on parole because he had been able to deceive his keepers. This poor creature was afterwards found dead—by his own act.

There are very many such lads, in their teens, in our midst, who are merely biding their time, merely waiting for the match of uncontrolled and uncontrollable excitement to start their brains of straw into a burning flame, and then our people will shake their heads and bemoan the existence "of such creatures."

In the recent scandal over the Rosenthal murder, many of the hirelings implicated in aiding and abetting the act are, without doubt, human firebrands—mental derelicts. Our prisons, our jails, our homes for fallen women, our truant schools and reform schools, all house the mentally unfit. Sometime ago, Dr. Fernald pointed to the fact that "feeble-minded women are sources of debauchery and licentiousness which polute the lives of boys and youth of a community, disseminate disease, and bring young children into the world destined to repeat their history". We have one classic record of the descendants of one defective couple in the State of New York, known as "the Jukes family," whose descendants, traced through five generations, numbered 1,200, 709 of whom lived, the majority being vaga-

bonds, paupers, criminals, and prostitutes. This one family is known to have cost the State of New York over a million and a quarter dollars in 75 years. Could we compute the monetary cost to our State of the hordes of families, living quite as notorious lives as did the Jukes descendants, the result would be more startling than was the shock of the *Titanic* disaster, and quite as inexcusable and unnecessary.

Almost all the physical defects to which children fall heir were found in the course of my examination; as a rule, one child presented several defects; those producing a condition of malnutrition were greater in number than others.

The condition of the children's mouths was in almost every instance deplorable. Only once, in a large number of cases (71.4 per cent) did one find good teeth; as a rule they were very badly decayed; in some instances extractions had been made, leaving the small jaw practically in a senile condition, as the permanent teeth had been removed and the child had nothing of account left with which to masticate. Hundreds of other cases had teeth in a very active state of decay, which could produce naught but poor digestion and, in turn, malnutrition.

Several thousand cases (77.5 per cent) showed marked tonsillar enlargement, with adenoids, producing improper oxygenation of the blood, high-arched palate, and a general lowered vitality of the whole body. More than three-quarters of the number of children presented some form of ocular trouble, ranging from a simple remedial strabismus to tuberculosis and tumor of the eyeball. About half of the number presented impaired hearing. Nearly one-third showed heart lesions, some of a very serious type. That giving the largest percentage was mitral-regurgitation—in a very large number without compensation. Tachycardia was a very common symptom among these children of defective mental caliber. The usual variation from the normal in children whose hearts should presumably have reached the normal adult thythm was 135 to 145; many cases, however, exceeded this count, some running up to 165 and a trifle more. Naturally, where "rapid-fire drills" occur at any time, these children present a serious menace to the entire school for, though our schools have been particularly free from serious fires, one never knows when the drill may be because of necessity, rather than as a matter of routine training. I have known of instances where a small child suffering from tachycardia has been picked up and carried down the stairs by the teacher in order to avert a scene, and perhaps a panic. This condition which I have found so frequently should serve as a warning, as well as a positive proof, that all classrooms for children who are mentally defective should be on the main floor; such children should never be permitted to go above the first flight.

I might here interpose a plea to other medical men and women whose duty it is to examine large numbers of school children that they make as careful examination of the child's heart as is possible. Frequently their care will reveal much which may prove of inestimable value in the treatment and proper school care of the young one. Chorea and epilepsy have an appreciable showing, though not so large—possibly 1,000 cases in all having one or the other—as one might suppose. This fact has been a surprise to me, as I had always thought the proportion larger.

Speech anomalies were very numerous; fully 42 per cent of the children were suffering from defects of this sort. Many of the cases were of purely neurotic origin and were remedial, still others were improvable, while some were of such a nature that little or nothing could be done for them. Stuttering, stammering, and lisping were among the most prominent defects. The high-arched palate of many of the children was a cause of defect hard to remedy, as the tip of the tongue has no chance to approximate its proper functioning, while cleft-palate, mostly nonoperative, caused other nonremedial defects. There was also an appreciable number of children who had never spoken, but whose hearing seemed unimpaired. As fast as it is possible to care for this class of cases they are being segregated into what is termed "speech classes for hearing mutes."

Naturally, the neurotic cases were numerous. About one-third of the total number showed marked instability of the nervous system, while more than half presented sexual disturbances. Many masturbators came under this heading. A goodly number showed the sequelæ of such diseases as spinal meningitis and infantile paralysis, and many a sorrowful mother has been able to give a good history of her child up to the onset of one or the other of these dread maladies. The seeming results of alcoholism in the parents have been especially noted among the children of longshoremen, truckmen, and those parents whose occupations expose them to the rigors of our climatic changes. Along our lower West Side and in that section of our city euphoniously known as Hell's Kitchen, I found the greatest number of children presumably suffering from this heredity. If the teachers' statements are of any worth, these children are reported as being extremely neurotic and inflammable and show more really ugly characteristics than any other children thought to be defective.

Perhaps one of the most interesting phases of my work has been the attempt to tabulate the nations represented by the children sent up to me for these special examinations. It is only in the natural sequence of the manner of growth of our population that a very large percentage of the cases of mental defect should be found

among our alien population, for in such a cosmopolitan city as New York nearly all nations send representatives—one might say misrepresentatives, for, surely, no mental derelict can truly be said to represent his or her native land. Up to the present—and, at this time, one can not tell what changes may occur—the two nations which may be said to lead all others are Russia and Italy. For a long time Russia was first on the list, but now Italy has come up to her and has even surpassed her by a fraction of 1 per cent. The German Empire and Austria have contributed no small number, while Britain sends her quota, Ireland leading, followed by England and Scotland; Wales has not contributed any subject for my study. The other countries contributing their quota have been Poland, Scandinavia, France, Bohemia, Roumania, Spain, Turkey, Switzerland, Syria, Greece, Arabia, Canada, West Indies, and, of the South American countries, Brazil.

These studies of our urban population are in no way complete, nor can they become so for a very long time, because of the inadequacy of the number employed in making these investigations. The need for more physicians who are specializing in this particular field of research is great, and their work should be augmented by that of an earnest, intelligent corps of social workers, whose time would be entirely devoted to the ferreting out of the kind of statistics which will prove of paramount value.

The hygienic relation of persons of such lowered physical and mental stamina to the body social, it seems to me, is so apparent as to make a summing up practically unnecessary. Surely no one in this audience needs to be prodded to do his duty in seeking the proper housing, proper segregation, and right and just laws for the unfortunate class of individuals we have had under consideration.

What we need in the United States of America is a realizing sense by our thinking people of the enormity of the problem which confronts us. Our immigration problem is tremendous. Gladly do we welcome the poor and the downtrodden of other nations, but we must be firm in our exclusion of the mentally unfit. Our work here must go on, not only at our ports of entry, but at the points of embarking, and the steamship companies must be held responsible for their unprincipled part in the bringing over, under much hardship, of so many cases of mental and physical unfitness.

Without a doubt we will always have the " ament " and the physical defective with us, for so long as we disobey the laws of hygiene and of health we must expect at least a part of the punishment meted out on the innocent offspring. It is largely dependent on those of us who are alive to the immenseness of the problem and who are in vital touch with it to make our voices heard whenever and wherever we

find opportunity to do so. We must even make these opportunities, and we must have our lawmakers become familiar with the class of cases herein described. They must be made cognizant of the conditions producing such defectives, and then made intelligent as to the direful consequences of legalizing the propagation of the unfit.

The task is stupendous, but if all interested will loyally pull together for the common good of humanity I am hopeful that we may accomplish much. "Nothing great was ever achieved without enthusiasm."

Percental chart of 10,000 cases showing relative physical defects.

Chorea	4.0
Epilepsy	5.1
Heart	29.9
Nose	34.9
Throat	42.6
Neurotic	**37.0**
Sex	41.5
Speech	42.0
Ears	48.3
Dental	71.4
Indicating general medical care	74.3
Eyes	95.3
Needing residential hospital care	6.9
Needing special open-air school	3.5

Percental chart of 10,000 cases children born in foreign countries.

Italy	15.3
Russia	15.1
Germany	7.7
Austria	3.5
Ireland	3.3
England	.9
Roumania	.8
Scandinavia	.7
Polish Jews	.5
Bohemia	.5
France	.1
Scotland	.1
Greece	.07
West Indies	.07
Turkey	.07
Spain	.06
Syria	.06
Canada	.04
Switzerland	.03
Holland	.03
Brazil	.03
Cuba	.01
Arabia	.01
Unknown or mixed parentage	8.3

Percental chart of 10,000 cases children born in United States.

Russian parentage	20.5
Italian parentage	18.9
German parentage	13.9
Irish parentage	7.1
Austro-Hungarian parentage	5.8
English parentage	1.9
Scandinavian parentage	1.4
Roumanian parentage	1.1
Bohemian parentage	1.0
Polish parentage	.7
Scotch parentage	.3
French parentage	.2
Spanish parentage	.1
Swiss parentage	.1
West Indian parentage	.1
Turkish parentage	.07
Dutch parentage	.07
Greek parentage	.07
Syrian parentage	.07
Brazilian parentage	.04
Cuban parentage	.04
Arabian parentage	.01
American (whites and negroes)	17.3

25.42 per cent of all cases were of foreign extraction; 48.05 per cent of all cases were American born of mixed foreign parentage.

Of these 21.8 per cent were Russo-Polish Jews, 19.6 per cent were Austro-German Jews, and 58.6 per cent were various mixtures.

17.3 per cent of all cases were of native birth and parents; 82.7 per cent of all cases were of foreign birth or parents.

DISCUSSION.

Dr. Maximilian P. E. Groszmann, Plainfield, N. J.: It has been claimed that at present there are no funds available to take proper care of the mentally defective children in custodial institutions. This is a fallacy, as we are now spending much more in the wrong way for these children than would be necessary if we took hold of them in the right way and at the right time. Consider that we spend from three to four times as much for each "defective" child in a special class as the per capita cost of the "average" pupil. And then, this money is wasted, inasmuch as the defective will remain a burden to society after passing through this special education. Add to this the expenses of the reform school, industrial school, truant schools, and other institutions in which such children will eventually land, and you have a second idea of cost. Again, add the cost of almshouses for the derelicts, and the expense of police courts, and the so-called administration of justice in general, which is necessitated by these children growing up and remaining at large; add, further, the enormous sums given to so-called charity which again

go to the inefficient, the failures, the derelicts, and you will count the amounts thus futilely expended by the many hundreds of thousands. And this spending does not mean an investment, as these derelicts constitute no possible social asset at any time. Think of the expense caused to New York County by the one "famous" trial of Harry Thaw. Such cases are legion. If we consider all this we shall understand how we are misspending vast sums, and that by taking care of these hopeless classes of children at the right time, and in the right manner, we would really save and economize. We must open the eyes of the public to what would constitute a sane educational investment.

THE SIGNIFICANCE OF PHYSIOLOGICAL AGE IN EDUCATION.

C. WARD CRAMPTON, M. D., Director of Physical Training, Department of Education, New York City.

We are beginning a complete readjustment in our methods of caring for the child in medical, social, and scholastic ways, and we have consciously begun this revolution by assuming a critical attitude toward our general practice of classifying all children on a basis of chronological age—the number of years which they have lived. The readjustment, when complete, will provide a new basis for record, investigation, and treatment of all kinds, and this basis will be the physiological or psychological age.

The doctrine of physiological age affirms the fact that mental and physical development of children, adolescents, and adults, proceeds through easily recognizable and discrete stages, and maintains that all classification and grouping of the growing and developing human being should take cognizance of, and relate themselves primarily to, these stages; and, secondarily, and in a decidedly minor way, to the artificial groupings upon the basis of the school grade or chronological age.

This doctrine is based upon a careful but as yet incomplete survey of developmental stages, and a search for easily recognizable signs which accompany each stage. The developmental signs may be anatomical, such as the appearance of the six-year molar, the wisdom tooth, or pubic hair; physiological, such as menstruation, change of voice, menopause; or psychological, such as change of rote to associative memory, the wane of the collecting tendency, the budding of the earning instinct; and, later, the characteristic rumination of senescence. In short, we have sought to ascertain by extended and intensive investigation what the significant stages of change may be, and to discover easily recognizable signs whereby we may, from observation, denominate a child or adult to be in this or that stage,

so that we might place him in classes of individuals of the same stage of development, for the purpose of adjusting and standardizing our medical, scholastic, and social treatment to natural instead of artificial requirements.

DEVELOPMENTAL PERIODS.

Intra-uterine growth is extremely rapid; after birth, it is followed by a rapidly decreasing rate of growth and development, until, at the age of 2 or 3, the child begins to grow at a slowly increasing rate, until a plateau of almost no growth and development is reached at about the chronological age of 7 or 8. The static condition is maintained until there has commenced the great pubertal age. At this time, the most important epoch of adult life, second only in significance to the event of birth, the child commences a period which can only be likened to an explosion of growth and development. He begins to grow tall with great rapidity; weight is added pound by pound, and, with the increased bulk, comes a rapid addition to the muscle, strength, and motor ability. This age is most prone to begin during the warm months of the summer, and when it does occur, a single month may add an inch in height, 20 pounds in weight, and double the muscle force. After a variable length of time, a year, or a year and a half, the increase in height, weight, and strength gradually return to a slower rate, and the body and mind proceed with a stage of ripening which we call adolescence. The following normal boy illustrates a rapid change from prepubescence (noted as stage 1) to postpubescence (noted as stage 3) occurring in the summer between 14 years 8 months and 15 years 3 months. The actual weight, height, and strength of grip at 13 years 8 months is given on the line above the table which notes only increments:

[A. J. F., height, 148 pounds; weight, 41.7 pounds; strength, 32.]

	Stage 1.			Stage 3.	
	13 years 8 months.	14 years 3 months.	14 years 8 months.	15 years 3 months.	15 years 8 months.
Increase in height—centimeters		2.0	1.7	5.4	4.5
Increase in weight—kilograms		.9	.9	4.5	5.3
Increase in strength—kilograms		−2.0	−1.0	9.0	5.0

This table is typical, and shows, moreover, that accelerated growth in weight, height, and strength occur together, and not in sequence, as St. Hilliare has stated.

Referring to the whole progress from birth to maturity, we can catalogue the appearance of each new added structure, function, and mental ability, the whole forming a complete series from start to

finish. Nor need we end our catalogue with maturity, for even on this high plateau appear new physical features, and mental traits which determine important epochs in human life; even after this, the downward slope of existence shows salient points, such as menopause, canites, and tissue hardening, which mark physiological stages of exceeding definiteness and importance.

In this catalogue of events, physiological and mental growth do not proceed in an orderly fashion year by year. Some may be hurried, others retarded. Individuals rush past others for a time, and then lag behind. Whole nations seem to develop rapidly up to a certain point and then fall back behind others of steadier growth.

We can not tell, from the number of years which the individual has lived, what stage of development he may be in. The calendar and the chronological age based upon it do not give us trustworthy information; and, strange to contemplate, the general error of science, medicine, and education is a blind adherence to a chronological age.

To illustrate that important measurable differences exist between boys of the same chronological age who differ only in epoch of development, the following table of weight by half years and stage of pubescence is given. (Prepubescence 1, pubescence 2, postpubescence 3.) From this table, it is apparent that postpubescents average about 10 kilograms heavier than the prepubescents of the same age. The differences are most marked and striking. In one age group (14.25) 102 postpubescents out of 222 are heavier than the heaviest prepubescent of the same age, a fact which accentuates the absurdity of considering the two groups as one, as we have done hitherto.

Weight and pubescence.[1]

Weight (in kilos).	Age.											
	12.25 years.			12.75 years.			13.25 years.			13.75 years.		
	Stage 1.	Stage 2.	Stage 3.	Stage 1.	Stage 2.	Stage 3.	Stage 1.	Stage 2.	Stage 3.	Stage 1.	Stage 2.	Stage 3.
20–24							1				1	
25–29	2			1			10	1		11	3	1
30–34	4			11	4		44	13	2	73	22	7
35–39				13	5		45	22	6	57	38	20
40–44				1	2	1	12	10	12	20	21	30
45–49								1	5	3	8	24
50–54						1			3		1	9
55–59						1			2			4
60–64									1			1
65–69												1
70–74												
75–79												
80–84												
85–89												
Total number	6			26	11	3	112	47	31	164	94	97
Average				35.19	36.59	(50.8)	35.04	37.18	44.27	35.40	37.98	43.84
Sigma				3.17			4.17	4.04	7.02	4.27	5.26	6.94

[1] American Physical Education Review, Vol. XII, Nos. 3–6.

Weight and pubescence—Continued.

Weight (in kilos).	Age.											
	14.25 years.			14.75 years.			15.25 years.			15.75 years.		
	Stage 1.	Stage 2.	Stage 3.	Stage 1.	Stage 2.	Stage 3.	Stage 1.	Stage 2.	Stage 3.	Stage 1.	Stage 2.	Stage 3.
20–24												
25–29	17	5		6	3		1	1	3	1	1	1
30–34	54	25	8	25	26	8	11	17	9	8	6	4
35–39	46	59	44	40	53	46	22	45	32	7	11	22
40–44	22	27	68	11	29	62	7	18	65	2	7	55
45–49		13	52	2	9	76	5	6	70	1	9	78
50–54		2	27	3	3	57		4	61	1	2	62
55–59			13		1	19			31			40
60–64			6			6			13		1	14
65–69		1	3		1	4			3			2
70–74						4						4
75–79			1			2			1			
80–84												
85–89												1
Total number	139	132	222	87	125	284	46	91	288	20	37	283
Average	35.13	38.63	45.45	36.76	38.86	47.21	37.93	38.76	47.70	36.75	41.29	49.31
Sigma	4.49	5.67	7.47	5.17	5.88	8.07	4.75	5.06	7.81	5.76	7.11	7.78

Weight (in kilos).	Age.								
	16.25 years.			16.75 years.			17.25 years.		17.75 years.
	Stage 1.	Stage 2.	Stage 3.	Stage 1.	Stage 2.	Stage 3.	Stage 2.	Stage 3.	Stage 3.
20–24									
25–29									
30–34	1	1	1		1	1	1		
35–39	1	3	7		1				
40–44	1	2	21	1	1	9	1	5	1
45–49	1		34		2	29		15	3
50–54			46			25		7	8
55–59			31			22		12	4
60–64			13			13		10	2
65–69			1			2		4	5
70–74						1			
75–79			1						
80–84									
85–89			1			2		1	
Total number	4	6	156	1	5	104	2	54	23
Average	(40)	(38.32)	51.55	(42.5)	(41.5)	53.51	(37.5)	54.92	56.41
Sigma			7.57			8.24		8.59	

Strength of grip, and height, have been recorded in the same way in over 6,200 cases, and the differences of these two characters are as great as those observed in weight.

Scholarship also varies with pubertal stage. In the high schools the postpubescents do from 30 to 50 per cent better in their studies;[1] in the elementary schools the prepubescents lead from 30 to 47 per cent.[2]

EDUCATION.

The particular periods when instincts appear have (in small part) been noted, and appropriate instruction has in the main been pro-

vided, but the great failure of education to-day is its inability to recognize the fact (where it is absolutely essential that it should) that children differ in rapidity of development. Its maladjustments are particularly evident and distressing at or about the time of puberty. The change from an asexual to a sexual life may occur at any age from 6 to 20 years, usually between 12 and 15, but when it does occur, the changes are profound. In the short space of six months the child becomes a man or a woman, and the process is fraught with the dangers and turmoil of a new birth. There is an outburst of physical growth, 4 to 5 inches are added to height, 30 to 40 pounds to weight, and strength may be doubled in a short space of time. New mental abilities appear, while others disappear, the type of play changes, new companions are sought, new likings, tendencies, enthusiasms, and emotions make up the whole life. Old landmarks of life fade and new ones are eagerly sought.

The sexual ripening determines an entirely new outlook upon life, the earning instinct looms large in the boy, and the home-making instinct in the girl.

The important fact that is constantly disregarded is the fact that the pubertal change leaves the child a wholly different being—different mentally, physically, morally, and ethically from the children in the stage just left behind.

This disregard results in the endeavor to teach classes that are composed of children of both prepubertal and the postpubertal stages, the immature and the mature.

Sitting alongside of each other, receiving the same teaching, subject to the same regulations and discipline, are children three or more years past puberty, and others three or more years lacking before the change will occur. The result is a chaos. No one course of study can be fitted to their disparate needs, and no one form of discipline can be enforced with each group with equal success.

This condition obtains in the whole of the grammar department of the elementary school, and in the first year of the high school. It is particularly troublesome near the point of articulation of the two schools.

The elementary school commences theoretically at or about the age of 6, when the child is able to go to and from school, and has become a burden at home, which the head of the home, the mother, can and should shift in part to the shoulders of the public. The lower school has for its opportunity the years up to the time when the child reaches its pubertal age. This is between the age (on an average) of 13 or 14; hence, allowing for slow progress, there will be about 7 or 8 years for the elementary school. From ages of experiment, it has been found that the child will not study in school after this epoch has been reached unless undue compulsion has been used. The elementary school is

naturally self-limited by the advent of puberty. The postpubescent child is often kept in the elementary school by force of will and authority, and what is worse, he is subjected to the same treatment as the immature child.

The National Education Association, in its July meeting, in 1911, adopted without dissent declarations containing the following:

That the laws should recognize the difference between the chronological age of a child and his maturity, and that the school-age limit of each individual child should be determined by requiring the child to meet physical and mental tests, even though the child be in years above the age standard; in other words, a child's actual age should be determined by physio-psychological data corresponding to the normal standard for the age limits required by law. All children or persons failing to meet such maturity tests at the extreme school-age limit should remain under public supervision and control, either until they reach maturity or permanently.

The same principle should be the guide in determining whether a child is fit to be employed in any occupation. Not whether a child is 14 or 16 years of age, but when he possesses the maturity of body and mind proper to a normal child of that age should he be released from the guardianship of the State, of the community. Child-labor laws should be so modified as to meet this requirement.

The section on preventive medicine of the American Medical Association revised the report of the committee on medical inspection of schools, which broadly recognized the doctrine of physiological age:

Scope of the examinations: Physical and developmental examinations should be sufficiently extensive to ferret out and determine, as far as possible, the causes of arrested growth, physical and mental.

1. The data of these examinations should serve as skilled information to parents and teachers in recommending and advising medical and dental aid essential for health and development.

2. When taken in connection with the school curricula and sociological factors of the pupils' environment, the data of these examinations should form the essential basis for the adjustment of educational activities, both physical and mental, to meet the requirements of physical and mental health, growth, and development. Further, it recommends "that not only the content of education, but all the processes of education, should be considered in relation to the health and growth of pupils and students. It challenges every subject of instruction and every principle and every method of education."

Its central problem is growth and development. To this end physical and developmental examinations ought to determine defective physical and mental conditions, developmental periods of growth and stages of development, physiological age, and, as far as possible, mental age. Further, it recommends "as far as practicable, the grouping of pupils in accordance with development age."

PRACTICAL APPLICATIONS OF THIS PRINCIPLE.

Those working with backward and exceptional children have very generally adopted the principle of classification on the basis of

various physiological and psychological epochs. Most prominent in the application of this method have been Goddard, of Vineland, and Groszmann, of Plainfield. Many of the Young Men's Christian Associations of the country now record pubescence on their examination records and regard it generally in the classification of their boys' departments. In many more they have divided the boys for the purpose of athletic competition on the basis of weight, which is a fair approximation to an actual division upon physiological lines.

In the New York City high schools this record has been made for six years, and in one high school there has been a division of classes upon this basis. In all schools athletic competition is based upon weight. In the management of boys in many summer camps the doctrine of physiological age has been applied with excellent results. Dr. George L. Meylan, of Columbia University, in his White Mountain camp, on Lake Sebago, classifies his boys into two groups—the immature and the mature—on the basis of the pubescence sign, and these two groups are again subdivided into two. He finds the boys have a "better time" grouped with mates with whom they would naturally associate under normal conditions. It is easier to select masters who are particularly able in handling one or the other groups, the more vigorous camp and field work can be given to the more mature group, and the immature get the kind of care which they particularly need, and which would be interpreted by the mature as restrictive measures. Sports, training, and competition are readily made to fit each group, and the handling of the camp resolves itself into natural and distinct departments. He disregards chronological age entirely, placing some boys of 14 in the most mature group and others of like age in the least mature group, as their stages of development warrant.

In the High School of Commerce eight sections of the entering class were arranged in homogeneous developmental groups on the basis of pubescence, and the remaining four were not so divided. In the arranged eight sections the rate of discharge from school was 35 per cent less than in the four unarranged sections and 33 per cent less than from the previous entering class, also unclassified:

Dr. William E. Grady, principal of Elementary School 64, Manhattan, offered to put into actual practice this doctrine. Since it was impracticable to observe the pubescence sign of puberty, the writer visited the school and divided the boys of each grade from 6 B upward on the basis of mere inspection. The boys formed a line and passed in review, each stating his age to the examiner. He was then given a number—one was most mature, five the least. The following signs were noted: The voice (changed and low or unchanged and high); the presence of the second molars; height and weight;

the subcutaneous fat of the face and hands. In the immature the subcutaneous fat is more evident and adheres closely to the skin, which is of finer texture; in the mature the skin is firmer and thicker, less attached to subcutaneous tissues, which contain less fat. The prepubescent is chubby, the postpubescent may be fat, but there is an easily recognizable difference. This inspection is frankly different from the examination for pubescence, and the resulting classification may or may not differ from a division on the basis of that sign. It stands as a separate, but allied, experiment, and its results are regarded accordingly.

To one who has made full examination of tens of thousands of boys, such an inspection approximates pubescent ratings very closely. It is important to note that any close student of boys may be almost equally adept, for the principal of the school, after witnessing the classification of three classes, designated the gradings for 20 boys, 18 of which were correct and 2 varied but one step. At the promotion immediately after this inspection the boys were grouped into classes, of which there were three of each grade, so that one class contained the most mature, one-third of all who were in the grade. The remaining two-thirds, less mature, formed the other two classes without further separation.

Just before the presentation of this paper, after the experiment had been in progress nearly two months, the writer interviewed the teachers of these classes to observe any results. It was surprising to find practically all of the teachers already had much to say upon the subject of the advantage of this grouping, and that they were of that type of intellectual independence that led them to give many observations regardless of their agreement with any preconceived thesis.

ADVANTAGES OF THE HOMOGENEOUS GROUP.

I present the opinions as follows: Social consciousness is solidified; a feeling of solidarity in older groups becomes apparent, whereas in the mixed group the older boys found themselves separate and often isolated individuals. The tone and consciousness of the class was one in which the most successful scholars, who were mainly the immature, became predominant and the older boys were out of the social current. The separation of the mature group from the immature gave a class in which each exhibited to all the similar aspects of maturity, and allowed them to feel the presence of neighbors of their own kind with similar social and scholastic tendencies, abilities, and disabilities. As one teacher expressed it: "In the mixed class the older fellows didn't get together, now they do." This feeling of solidarity

has resulted in making discipline easier for teachers who recognized it, and harder for teachers who did not. Practically all the teachers became aware of the change, as it developed, and adapted their methods of control to meet the occasion.

With the younger group, the stern authority of the teacher carried the day; the ipse dixit was appropriate and sufficient. With the mature group, this class consciousness instantly arose against any punishment where innate righteousness was not apparent. The paternal method was not to be tolerated, and treatment which recognized the intelligent and reasonable manhood of the group was demanded and obtained. Discipline became fraternal; a thing belonging to the class, which the class regulated for itself. The teachers came to know this quickly and adopted a method which bore all the essentials of a self-disciplining self-government. As one teacher says, "You can treat them like men now; you couldn't before; for the youngsters couldn't understand it; and, besides, the shame of criticism before inferiors (the immature) made them surly."

Reaction to studies.—The separation of the mature group made perfectly clear that this group was different, and, in the main, less successful in their studies than the immature. They are, in general, the slow students, or they would have completed the school course long before. One teacher states: "They were 40 per cent slower, and intellectually clumsy." There is a general agreement among all teachers that the big boys are doing better by themselves, because they are free from the irritating superiority of the smaller boys, whose success was likely to be held up to them as a pattern and example. They feel more at home, and work with a much better spirit, and will plod energetically along in a task that is given to them.

Above all, the teachers report that the older boys must be given work that appears to be reasonable. The learning of rules and the attack of a problem from the academic standpoint bring little reaction, while the application of a principle to present or prospective experience is grasped with a positive avidity. The immature will often collect information with the same interest that they collect postage stamps; the mature see the matter in a different light. This principle once sensed, applied teaching becomes easier and learning more rapid, and dull boys become earnest workers. Many of the teachers were so emphatic on this point that they urged the necessity of new subject matter and different pedagogical methods, and have begun to adjust both matter and method to the problem.

The younger group are inclined to take the teacher's word for the importance of the subject and react well to the descriptive, specific, and particular, while in the older group the general is sought and

appreciated. It is evident that there is present the result of the budding of a desire, and an ability to organize knowledge upon a conceptual and reasonable basis and to adjust the same to present experiences, rather than a characteristically immature desire to acquire various kinds of knowledge and proficiencies which are valued for themselves and significant as acquisitions, and for which the value of use has but a minor appeal. This is but another way of expressing the statement, found in one of my earlier reports, that the "earning instinct" has arrived and has colored all intellectual processes.

Arithmetic.—A teacher, who instructs both mature and immature classes, states that there are decided differences in their respective reactions to teaching; the immature will do anything you tell them to do; for instance, they will learn the rules and mechanism for doing square root without question or resistance, and will be able to accomplish the desired result. The mature group find it difficult to do anything for which they can not see any practical value. If the problems are given a business application, however, they (in the words of the teacher) "jump at it." The younger group are malleable and docile, but the mature must be shown something "real" upon which to base their interest. The old mixed class required the teacher to use two methods, or to use one method for only half the class at a time. The new plan gives one a chance to choose the proper material and the proper method of using it, which is different for each of the two classes.

Penmanship.—In the old plan of mixed classes the mature boys considered it beneath their dignity to work seriously in penmanship, for the smaller and more agile immature boys were far superior to them. "Well, he's a kid, and he can do it," was the general attitude. The teacher of penmanship realized the open avenue of attack was along the vocational line, and, following it, enlisted the strong cooperation of his mature group. They appeared before as isolated, slow, and poor performers, continually at a disadvantage; they now have the feeling of working shoulder to shoulder with their own kind and for a common intelligent purpose.

English.—The younger group are interested in description, and do it well. Their imaginations are lively, and fairy tales still retain a significance, while the older group seem to have lost the fancy which roams afield, and would center their attention upon the facts of life. While their ability to describe the hypothetical, historical, or the imaginative is apparently diminished, it is really made more intensive, and focused upon experience. They become more adept at exposition, and can state the import of serious matters of their own personal interest with becoming facility and directness. It is easy to interest them in elaboration of subject matter, and difficult to keep

their attention centered in analysis and syntax, which appeal strongly to the immature.

In singing, it was, of course, found that the mature had changed voices, and this facilitated the arrangement of classes in assemblies where it was an advantage to segregate those singing different "parts."

In physical training, the most apparent differences in reaction time, and in the ability to do vigorous work, were noticed. What would exhaust the immature was just right for the mature, and what would fit the immature was not sufficient to stimulate the interest of the better developed. It is certainly obvious that no single period of exercise can be made to fit equally well two groups, one of which is from 30 to 50 per cent stronger than the other.

This experiment has demonstrated first the ease with which a school may be arranged upon the basis of physiological age, and the advantages which may result from it. The results substantiate the claims made for this method in my previous reports, and may be summarized as follows:

1. Boys in a homogeneous class feel more at home, and form for themselves a coherent social consciousness.

2. Consistent methods of management and discipline may be adapted to the whole class.

3. Choice of subject matter may be made appropriate to all, instead of a fraction of the class.

4. Teaching methods and manner of appeal may be chosen with the problem of but a homogeneous instead of a diverse group of students.

The whole should render school management more simple and teaching more effective.

The practical application of this doctrine will result in the removal of the immature from the high school, where they do not belong, and where their scholarship is poorer than the mature. They may be kept in a ninth year added to the elementary school. This will leave the high school to the mature alone.

The mature should be removed from the elementary school and placed in subgrades added to the high school, or in an intermediate school, where their young adult possibilities may be fostered and find unimpeded development.

CHILD LABOR.

During the last 20 years there has been an organized movement toward the enactment of child-labor laws, and no legislation has been, on the whole, more beneficial to the child and the community at

large. It has in the main protected the child from the strains of labor and conserved the health of the workers of this generation and has saved the lives of countless children.

These laws are, however, faulty and irrational, for they are based upon a chronological age. Immature children of 14 are allowed to work, even though they will not become mature for two or three years afterwards. Mature children under 14 are not allowed to work, even though they are strong young men and women who have passed the stage of puberty years before, and are relatively well ripened for the strains of life. This is manifestly absurd. The only rational procedure is to place the question of allowing children to labor, or not, upon the result of a physical examination to determine their maturity or immaturity. The sign of puberty, pubescence in the male and menstruation in the female, or, if feasible, pubescence in both, may be easier of determination, and, moreover, be a proper criterion.

Rotch, of Boston, has placed before the public recommendations to the effect that the appearance of ossification centers in the wrist should be used for this purpose. While this criterion would be important if it were true, it is, unfortunately, not true. Up to the present time, in several bulletins issued by Dr. Rotch, there is, unfortunately, not a shred of evidence that the development of the bones of the wrist have related to them in any way any physical or mental ability of any kind, and not until this evidence has been presented can we in any way give attention or credence to the claims of this method.

Dr. Rotch's developmental processes, which cover about the stage of the appearance of puberty, and are labeled H, I, J, and K, differ from each other only in the fact that they are the same as the previous stage, "only more so"; that is to say, stage J differs from stage K only in the fact that the bones are slightly more developed and more massed together. Unfortunately, this is a matter of opinion that is not objective enough for scientific or practical purposes. Also, there is no particular reason why the bones of the wrist should be given preference to the bones of the ankle or any other convenient part of the body. This is particularly distressing, for we have found that ossification does not proceed regularly throughout the body. There is even a difference between the right and left wrist, and if we were to follow Dr. Rotch's ideas we might be forced to put the left hand at work and to keep the right hand idle.

SUMMARY.

There are in childhood and adolescence easily distinguishable epochs of development.

Children of the same age but in different epochs may differ from each other 50 per cent in degree in certain characters and wholly in kind in certain other characters.

There are certain easily recognizable signs which may guide us in distinguishing the different epochs of development.

Children of wholly different developmental abilities are now taught by the same educational process. This is absurd and should be stopped.

Every scientific study of children (particularly of those from 10 to 15 years of age) must contain reference to physiological age, and no scientific study is complete without such reference.

---

[1] Op. cit. pp. 23–32.

[2] Pedagogical Seminar, Vol. XV, pp. 230–237.

WEDNESDAY MORNING, SEPTEMBER 25, 1912.

THE RELATION OF TEACHER AND PUPIL, WITH ESPECIAL REFERENCE TO THE EDUCATION OF IMMIGRANTS AND OF THEIR CHILDREN IN AMERICAN PUBLIC SHOOLS.

Dr. William Estabrook Chancellor, New York, N. Y.

The problem of how to keep children in school became apparent when compulsory-education law enforcement did keep them in school until they were 14 years of age. Then, as Dr. Leonard P. Ayres showed us in his epoch-making book, Laggards in Public Schools, they fell out by millions, as down an educational precipice. We have only 2,000,000 boys and girls from 14 to 19 years of age at school, when statistics show that we might have 9,000,000. Of these, however, 3,000,000 are not educable. at least by modern methods, beyond the sixth grade. Our problem is, therefore, how to keep more of the 4,000,000 educables now out of school in school.

In a general way, not drawing fine distinctions, we may classify youth into these grades and kinds of ability, viz:

Grades of ability.—Eunoiacs (well-minded), morons (habit-minded), imbeciles, idiots (abnoiacs or nonminded), and paranoiacs (side-minded) or insane.

I yield to none in zeal to improve the condition of the poor and of the defective; I would not diminish by a hair's breadth the significance of poverty and of physical defects in retarding pupils. But, in handling tens of thousands of school children in Paterson, N. J., and in Norwalk, Conn., in comparison with a different kind of children in the District of Columbia, I came upon a discovery which is the cause of this communication. I found that the frequently retarded school child of foreign birth or parentage is the victim of a false educational relation—that his most important need is of the right kind of teacher.

This is a matter of technical school administration that is largely at fault. Usually, the youngest teachers are assigned to the lowest grades. Such is indeed the law here for the District of Columbia as enacted by Congress. All beginners, male or female, begin in first or second grade. Now the objection is not to the beginner, as

such, but to certain kinds of beginners, as these statistics seem to show.

For my data I present the situation in the town of Norwalk, Conn., founded in 1641, present population 26,000, school enrollment 4,500 pupils. It is an example of social fact that the kingdom of the Anglo-American here is being divided and given to another because he has been found wanting. Of the school population, 600 are of colonial or ante-bellum descent; the rest are "foreigners." Of these latter, 400 are of Irish and German descent of but two generations, but, being thoroughly Americanized, they should be counted with the Anglo-Americans, for practical purposes; 3,500 are of recent European or other non-American origin, representing 42 different nationalities, mostly Hungarians, Bohemians, Italians, and Russian Jews.

Because we know now that heredity is not additional and accumulative, but selective and multiple, not of some ancestors but of dominant ancestral traits, I submit the facts as to the marriages for several generations whence these 4,500 children sprung.

Marriages.

Total number under review	14,000
American upon both sides	4,000
Foreigners of the same race upon both sides	8,800
Mixed marriages, total	1,200
Foreigners with Americans	700
Foreigners not of the same foreign race	500

By "foreigner" I mean when either foreign born or one remove from foreign birth. In every single instance, there being absolutely no exception, in the 700 marriages of foreigners with Americans, the female was American, the male foreign. I have no exact statistics and can not say definitely in how many of these 700 marriages the American woman was really but at the second remove from foreign birth and of the same race as her husband; but I have a definite opinion that, in over one-half the cases, the American woman was more than two removes from foreign birth, and also not of the same original nationality as her husband. I know many cases where she was genuine Anglo-American, that is, Yankee, and many other cases where she was either Irish or German in part and Anglo-American in part.

Of the 500 mixed foreign marriages, in only 7 cases did they marry across the degrees of latitude. They ignored religion and race and nationality and language, but they did not ignore north and south. Almost no northern European cares to marry a central or south European, and almost no central European cares to marry a north or south European. Often the Slav married the Celt, the Teuton the

Scot, the Russian Jew the Hollander across many degrees of longitude. In nearly all cases the males came from eastward of the females; that is, the Irishman married the American resident; the Englishman, the Irish woman; the German, a Holland woman; the Russian, or Russian Jew, a German woman.

When he can secure an American-born, English-speaking wife, the foreigner male does so. He seeks to identify himself as an American. But, on the contrary, the foreign woman never marries an American man. She either marries a foreigner, or stays unwed. Here is a sex difference worth considering.

Of these 4,500 children, 170 represented three or more races within three generations. Perhaps the most interesting case was that of three children whose father, born in Scotland, had a Norwegian fisherman father and a Bohemian peasant mother, and whose mother was of old colonial Yankee stock, herself and her forefathers, for several generations, college graduates.

These foreigners, in selecting American wives, choose the physically and intellectually superior. Their marriages have as issue less than one-half the average of foreign families. But the quality is notably superior. Every race intermarriage bears only American children. The boy whose father is a German but his mother is Irish can be neither German nor Irish in sentiment, but must be American. The "old country" is never talked of in such homes. The boy whose father is a Pole but whose mother is a French Canadian talks English at home.

All the problem, therefore, of Americanizing the foreigners' children rests with those families both of whose parents are foreign of the same race and language. The influence of the genuine Anglo-American children upon these foreign-environed children is benignant. Being American, mainly, they let them alone. They never attack them. They never order them about. They play games with them, and even teach them how to play. But they cross their paths infrequently. But between the foreigners often there is war, especially between those whose race habits were widely separated in latitude, as the Hungarians and Italians, who are notably antagonistic.

It is a situation of race recomposition and of social kinesis. There is a deal of friction about the mills and tenement streets. Part of the explanation consists in somatological facts. The Slavs represent a high form of brachycephaly. I have measured a child whose cephalic index was as high as 121°; several children above 110°; and many above 88°. That, indeed, is the average. Over against the Slavic extreme brachycephaly stands the South Italian dolichocephaly, often as low as 67°, and averaging 68°. Here and there in this social aggregation are new Teutonic foreigners, with their rec-

tangular dolichocephaly runnning about 77° or 78°. The cephalic index means something. For one thing, the brachycephalic races of Europe are all of them devoted to communal life. They are anti-individualistic. Moreover, they are also plateau peoples, with large lungs and short thick bodies. The Mediterranean, South Italian race, highly dolichocephalic, is impulsive, individualistic, passionate. And we must Americanize them by teaching them to live together in mutual forbearance. With their prolific families, they are to be the heirs of the laws, institutions, buildings, land, ideals. In all the great cities, from Portland, Me., to Portland, Oreg., the Anglo-American is giving place to the dolichocephalic Russian Jews, the brachycephalic Slav, the yet more dolichocephalic South Italian, Greek, and Syrian, and to such as these.

The frequent assertion that we are both educating and Americanizing the foreign children is sheer error. It is an assertion often upon the lips of men themselves not Americanized, and scarcely educated.

To be educated is to have one's powers released and trained, to be developed to the norm of one's natural inherited capacities. To but few persons in any land does this good fortune ever come. To be Americanized may be to be either more or less than educated; it is a different thing. Few of the foreign-born or of their children, unless they represent mixed marriages, are ever Americanized.

To be an American is to seek neither to please nor to oppress; the American is on the level; he can not cringe or cower, and he would not tyrannize. He is indifferent and tolerant. Americanism is far easier for some temperaments than for others. It is, of course, easiest for the rectangular dolichocephalic. The average Anglo-American has a cephalic index of 78°; so has the Yorkshireman, the Dane, and the Swede.

Americanism is impossible to some grades of ability. The idiot, the imbecile, even the moron, can not compass Americanism. Perhaps, with plenty of play and spontaneous occupation, we can save the South Italian and the Hungarian and the Russian Jew from becoming morons, as they are so strongly inclined to do.

Americanism is impossible with certain types of national mind. Races and nations have certain kinds of minds. All foreign peoples, as such, have one characteristic that is not American. Until we drive another idea in to take its place, we can not Americanize the foreigner. He and his son think poorly of women. He does not understand what we think of women. Of course, to Americans, our idea is simple enough. An American man looks upon woman and women as his equals, neither better nor worse, nor so different as not to be perfectly human. With him, his wife, his mother, his sister, his daughter, and every other woman is just another person. To her

sex he yields just one point, one only; he remembers the fact, and is a little more considerate of the woman's feelings. But even the foreign boy thinks himself superior to his mother and his teacher. When he is told the contrary, like his father, he supposes that the woman wishes to be treated like an angel, which is not so in the least. She wishes to have it understood that there is no sex in rights, in privileges, in laws, or in ideas, except in the single sex fact.

Unfortunately, we have not used the right kind of woman as proponents of this strange idea to the foreign child.

There are two general kinds of temperament, the motor and the sedentary. The motor temperaments are both active and resistant, the sedentary temperaments are passive and acquiescent. Temperament is more than an atmosphere of the soul, more than a temporary condition of the body. It is a physiopsychical character. This character is displayed in the time rate, which varies as 5 to 1 with various perfectly normal and sane individuals. The slow are not merely retarded or belated, they are on the slow freight. The fast are not merely ahead, they are on the fast express. The temperamental character is displayed also in the physiopsychical field. Some persons can consider two facts at a time and relate them; others, three; a very few, four; but many do not naturally consider; they act upon one fact. It is highly significant that in general, with exceptions, the fast do not consider many facts and the slow do. The express makes time, but the freight pulls the load. Again, the temperament is displayed in the action force, the action continuance, and the reaction. And it is displayed in certain characteristic emotions or affectional states.

We may grade temperaments in two ways, viz:

I. Temperament by time rate: (1) Precocity, (2) normality, (3) altricity.

II. Temperament by energy: (*a*) Motor—(1) Sense or "nervous," (2) sinewy, (3) muscular; (*b*) Sessile—(1) Vital or "corpulent," (2) reflective or "anemic."

Some races are precocious; as, for example, the South Italians, the real Negroes, the Celts (generally). Some races are altricious, as, for example, the Hungarians and the Swedes. It is significant that there is a precocity of mind that robs the body and makes it altricious, and there is a precocity of body that robs the mind and makes it altricious. But in the great majority of cases—in at least 80 per cent, in my opinion—physical age and psychical age are in close correspondence.

Every race has its characteristic temperament or temperaments. The Anglo-American is usually sinewy motor. The increasing muscular character of Anglo-Americans beyond the Appalachians indicates a considerable race change due to climate and to agricultural

labor. The Hungarian is heavy muscular motor. The South Italian is sense motor. The Russian Jew is sinewy motor.

I am aware that food supply and other factors make changes in individuals and in races, but I have specified the facts now present. Incidentally, I note that slightly shortened food supply stunts; much reduced causes height and thinness; greatly curtailed induces extreme sense disturbance and ends in nervous exhaustion. To give full normal race height and size and not overheight or under, overweight or under, a normal diet in quality and quantity is required, plus the characteristic race regimen and environment. In other words, American indoor city life is greatly changing the European outdoor rural laborer.

Human beings are their heredity times their environment. Biologists may say that heredity is far the larger factor, sociologists may press environment; but the main point is that we have here factors in a product, not addends in a sum. The school is a factor in the man, not an addition to a child. In multiplication every factor is vital.

Again, the human being is his physical body times his ideas, his mind, his soul. This mind or body or ideas or soul is his heritage of instincts, of capacities, of unit traits times his spiritual environment—that is, the ideas of his surrounding human society.

Now, the true significance of temperament consists in the fact that it causes selection or rejection of ideas. Each temperament is hospitable to some ideas, indifferent to others, hostile to yet others. Every man counts his own qualities as desiderata and his very deficiencies as virtues; and the qualities of other temperaments contra until life teaches him otherwise in some day of awakening and of regeneration.

Races also are hospitable or hostile to temperaments; many Europeans love, all Americans hate, the parasitic sessile—that is, lords. We scorn the scornful, refuse to admire them. And yet we have something to learn from the communalism of the Alpine and Carpathian Slav, to whom we are giving place; perhaps his temperament will save us also from the excesses of individualism.

The statistics of the town show that where the parents insist upon speaking the vernacular at home, the children get belated two grades; but though both parents are foreign, when they try to speak English at home the children are usually belated but one grade. Well-educated foreign parents by their good knowledge handicap their children. The Yiddish home conversation of the Jews retards even this precocious breed. The best condition is where the foreign parents speak their own vernacular and English together, not being conscious which is which. In such a condition the children practice English, teaching their parents.

It was over two years ago, when investigating the number of words in the vocabularies of fourth-grade children, that I stumbled upon my discovery. It made a deal of difference what teachers had the children in the lower grades, and it was a certain kind of teacher who rendered the service.

For lower-grade teachers we take either every beginner or the quick, vivacious, sympathetic, and attractive young woman. Sometimes a beginner succeeds with foreigners; but the quick, vivacious, sympathetic young woman never succeeds with them. I could cite a score of instances with minute explanatory details. The reasons of failure are two. First, the foreigners do not respect such teachers. Second, most of the brachycephalic and of the other non-English-speaking children are too slow to understand them. With the very teachers who do beautifully with the Anglo-American or Celtic-American children, the Central, East, and South Europeans do miserably, going usually but three grades in two years. But with other teachers I have made a fair correction. I shifted the attractive, vivacious young women to higher grades, and set stronger, less sympathetic, more dominant, older, muscular motor women in their stead. The result in two years in four of the urban foreign districts schools is told in these statistics, viz:

Numbers in grades.

Grade.	1907–8	1911–12
Fourth	195	306
Third	230	340
Second	260	375
First	395	350
Kindergarten	276	270
	1,356	1,641

Translated though these figures might easily be into graphic charts and curves, they are eloquent even as they stand. Much more could and should be done for these foreign-born children. But I feel warranted in saying that if the right teachers can be found and employed, the problem is more than half solved. We have gone from a condition where retardation and repetition were also concealed in part by calling many second-grade first grades to a condition where it is unusual to find more than two or three children in a classroom of 40 more than one year older than the course of study contemplates, which is this, viz:

Grade age.

	Years.
Fourth grade	9–10
Third grade	8–9
Second grade	7–8
First grade	6–7
Kindergarten	4–6

Already the change in policy has recorded itself in the higher grammar-school grades. In 1909 there was not one Hungarian child, with nearly 400 enrollments, in such grades. In 1912 three completed eighth grade, a girl of 15 being first in the class. She had justified her race altricity by standing higher than any one of the precocious 12 or 13 year old girls or boys of other races. It was not in the least a case of race sympathy with the teacher, who was a solid, mature, calm, Celt-American; literally, half-Irish, half-Yankee. The class represented a dozen different races.

SUMMARY OF PROPOSITIONS.

I realize fully that the propositions foregoing can not be accepted as finalities; I do not offer them as such, but as modes of opinion, as suggestive bases of departure.

1. Temperament is a living fact, and it is an illusion that ideas change temperament. On the contrary, temperament rejects, selects, revises, and edits ideas. Temperament is the form and mold but not substance of mind.

2. But physical environment, especially air and food supply, do modify temperament, slightly in the individual, occasionally more so in his offspring.

3. Different temperaments are more or less antagonistic. Certain temperaments are modifiable into dispositions from inner experience in social relations. Such modification is slight, and usually but superficial.

4. Temperament is fully displayed in children about 10 years old. Children of certain temperaments drop out of school as soon as the law allows.

5. Races have typical minds.

6. The feeble and the habit minded are scarcely to be Americanized.

7. The best teachers for the foreigners in school are the muscular-motor, relatively resistant, and energetic, mature women. It should be the practice of school administration to assign such women to foreign classes. Such teachers can enforce American ideas.

8. Among the essential ideas of Americanism are: (1) The equality of all, including that of men with women. (2) Individual self-reliance. (3) The duty of self-improvement, because here is opportunity.

9. We can save for higher education the educable eunoiacs and morons only by right education in their first years at school. This right education means progress from motivation to sense intelligence, or to efficiency, and culminates in personal morality. Some stages are easy to some temperaments, hard to others, and vice versa.

10. In short, education, though universal, can not be uniform, but must be adapted to races, to temperaments, and, in substance, to each individual.

DISCUSSION.

Dr. Maximillian P. E. Groszmann, Plainfield, N. J.: Some of the points in Dr. Chancellor's paper might be disputed. But he has emphasized some very important facts. He has shown that there is an essential difference between retardation and arrest of development. The extraordinarily slow child he spoke of is nevertheless normal in capacity, although abnormal in rate of growth, consequently can not be classed as mentally defective. He further showed that the keeping of the mentally defective, of the uneducable, is not a public-school problem at all, but one of segregation. The school is concerned only in the educable child, though he may be retarded or handicapped in many ways. The problem here is to understand the differences in capacity, in rate of growth, in racial attitude, in temperament, in economic condition. It is time that we cease to approach this problem from the feeble-minded end and to concentrate our attention upon the educational needs of the educable child.

RESULTS TO INDIVIDUALS FROM MEDICAL INSPECTION.

Dr. Leo Burgerstein, K. K., Regierungsrat, Vienna, Austria.

State regulation of medical inspection is necessary to secure its benefit to the greatest number; mandatory laws are needed to make such regulations effective, and these will be most readily enforced where grants to public elementary schooling are made by the State, and so can be withdrawn. This system prevails in Great Britain, where over $66,000,000 were distributed in 1910, on the basis of per capita attendance in the public elementary schools of England and Wales.

In those European continental states where cities and country communities pay the whole of elementary schooling expenses themselves permissive State regulation regarding medical inspection would be of little use. In states where regulations have been introduced single cities had frequently begun the work before their introduction, and are now doing more than the regulations call for.

In Switzerland, in 1900, the federal department of interior issued instructions directing that where physicians are not appointed to make medical inspection, teachers shall examine children entering schools as to mental defects, hearing, speech, and sight. In Utah, in the United States, similar mandatory regulations, dating from 1911, call for examinations in sight, hearing, teeth, and mouth breathing. A provision such as was made in the State of New Jer-

sey in 1909 for the punishment of parents not giving needed treatment to children after examination would add to the effectiveness of a medical-inspection law. The ability of many parents to pay private physicians for treatment should make such a system an inexpensive one for the educational authorities.

Instruction at normal schools, in methods of testing vision and hearing, such as is provided for in the Massachusetts mandatory act of 1906, will make the results of tests by teachers more reliable. It should also be possible to use teachers in detecting the first stages of scoliosis, and in measuring chest growth.

The chief advantages of using the teachers for rough examinations of sense functions are three; first, that, owing to their familiarity with the children, they find it easier to obtain answers to questions than does an outsider; second, that, through their work, their interest in questions of hygiene is enlisted; third, that the method is inexpensive.

A combination of special examinations by teachers, with general medical inspection by physicians, such as is required by the mandatory regulations of the Federal District of Mexico (1908), will give far greater results.

In Ohio, the board of education was, in 1910, given the power to permit medical examinations of physicians chosen by parents, but, where such examinations are not made, to require examinations by appointed physicians. The results of this experiment are not known to me, but in Saxe-Meiningen, Germany, where medical certificates required from children on entering school may be filled out by family physicians, the parents of none of the 46,000 elementary school children chose to have the form filled out in this way. Better results in this and other points are commonly secured in the case of high-school students.

Several English acts deserve mention in connection with the subject of mandatory medical inspection. First in importance is the educational (administrative provision) act of 1907, which imposes on local authorities the duty to provide for the medical inspection of elementary school children, and gives them the power to make such arrangements as may be sanctioned by the board of education for attending to the health and physical condition of those children.

Also of importance in their results to individuals are the education (provision of meals) act of 1907, giving the local authorities the power to take steps to provide meals for school children; the children's act (1908), making possible the intervention of nurses in the examination of person and clothing; and the local education authorities (medical treatment) act (1909), which makes it obligatory for those authorities to charge the parents with the expenses of treatment, if they are able to pay.

The success of the act of 1907 was very noteworthy. It is remarkable that, from the beginning, the board of education held in view the most difficult and important question, namely, that of securing treatment. Use of hospitals and dispensaries having been made on a large scale, volunteer agencies have arisen, and school clinics have been started. As to State arrangements, much is to be learned from the acts and regulations and the reports of action taken in England. One year after the deciding bill of 1907 appeared, 314 out of the 328 educational areas of all kinds had school medical officers, and 55 local educational authorities had made arrangements for treatment. In the code year 1909–10, the school board decided that not less than three inspections are to be made during school life. During this year, 152 local authorities appointed nurses, 41 of whom were employed in giving treatments.

I must here make a general remark. The statistics which one finds in reports from different parts of the world, while often well composed, deal generally with ailments and defects found among school children; sufficient data as to the final results to individuals following upon medical inspection, that is, percentages treated and results of treatment, are rarely given. In trying to learn more by correspondence, one often sees clearly that this, the main point, is given insufficient attention.

It is a good feature of the laws of different States of America that individual examinations are required at least every year. Such is the requirement of the mandatory acts of Minnesota (1910) and Pennsylvania (1911). It is expensive to make good examinations of this kind so often, but it naturally promises much better control of the health and development of pupils, and should insure closer follow-up of cases.

I venture to say, however, that the main point is the attention given to treatment. Another good feature of American State regulations, first embodied by the Massachusetts act of 1906, and rarely touched upon in European cities, is the arrangement that examinations of teachers and janitors shall be included in medical inspection. It is sufficient to remember the many children infected by the tuberculosis germ, and that, as has been proved in Ontario, consumption can be very readily spread among the teachers; as has been shown in Denmark and England, it is probably more readily spread in different places than in other not unhealthy professions.

As to efficient arrangements for all schools in continental European States, I must refer to one example; the small State of Saxe-Meiningen, where a scheme similar to that of Wiesbaden is pursued. This system I shall characterize later. In Asia, there is the great example as to the number of children examined in Japan, where the State arrangement was introduced in 1898. In 1909, there were

about 6,000,000 pupils in the elementary schools; that is, 54 per cent of all such had been covered by medical inspection. In the same year, 6,975 physicians were engaged in medical inspection, which is obligatory except in very small places. The cost of all this work was, in the year referred to, about $100,000, which means a very small cost per pupil, taking into account physicians' services only. It would be of interest to know exactly the results to individuals in the matter of treatments and cures.

In European States, in which the State does not contribute to elementary schools, the expenses for public normal schools are often paid by rate, and medical inspection can, therefore, be introduced into those schools without difficulty. This plan was followed in Austria, in 1909, and it is to be hoped that those who, as pupils, have been impressed with the usefulness of medical inspection will, as teachers, become advocates for promoting the inspection in the several communities where they will some day teach. A similar influence is to be hoped for in the future, if inspection is introduced into high schools, as, in Europe, most leading positions in the administration are occupied by those who have been pupils in such schools, and who, from their positions in administrative or public life, may promote medical inspection in the most important of all schools—the elementary school.

In the high schools in several European States mandatory medical inspection has already been introduced; in Russia (1871), in Hungary (1885), in Norway (1897), in Servia (1899), in Bulgaria (1903), in Sweden (1905), and in Saxony (1908). In Hungary the physicians engaged in medical inspection have been obliged, from the beginning, to pass a special examination. In Sweden, in case of illness, indigent pupils are treated free of charge. In high schools, the best arrangement is for the medical officers to be also the head professors of gymnastics, as is the case in the College of the City of New York and in a Latin school in Lemberg, Austria.

Whether the permissive regulations made in 1889 in Norway, and those of 1907, in Connecticut; of 1908, in Scotland; and of 1911, in North Dakota, have had greater results than the introduction of medical inspection in a small number of towns, I should rather doubt.

In no large State in the world is a complete modern medical inspection of all schools made. The greatest advancement in Europe has been made, among the larger States, in England. There are also States where medical inspection has been decreed in a general way, but without great result.

In single cities the degree of progress made in securing results to individuals is very different. General and specialistic examinations are made a different number of times during school life, with varying degrees of exactitude; hospitals and dispensaries, more or

less conveniently situated, are used; general and specialistic school clinics are arranged; poor-law doctors, club doctors, and nurses are utilized; special classes for children with different ailments and defects, such as scoliosis, lameness, tuberculosis, ringworm, trachoma, defective speech, feeble-mindedness, high-grade myopia, and deafness, have been organized; different arrangements with regard to meals, clothing, footgear, bathing, open-air games, woodland schools, holiday camps, etc., have been made. As to the number of individuals reached, the good results are also different, and dependent upon how far practical arrangements have been made for children whose parents are unable to pay, and whether as a work of charity or as a duty of the community. There is no exact scale by which to judge the work in different cities, but different combinations of the various features occur, and different methods of putting them into effect. As my time is limited, I can not go into all the details concerning the various places; I choose, therefore, to mention some special cases as examples of methods employed for medical inspection.

As my first example, I choose the capital of Belgium, Brussels, which holds a remarkable position historically, and which, from the beginning, included treatments in its program. Medical inspection was introduced there as early as 1874. Annual examinations are made; also special examinations by oculists and dentists. Physicians prescribe, and janitors administer, under the teachers' control in the school itself, such drugs as iodine, iron sirup, patent food, and cod liver oil. According to the statistics composed at Brussels, and covering a dozen years, about 10 per cent of the pupils in the public schools have been treated in this way, and, out of the many thousands treated, 11 per cent have been cured, 69 per cent have improved, and, in 20 per cent of the cases, no result was obtained, or, at least, none was reported. Other Belgian cities have followed the example of Brussels in this regard, but, unfortunately, among foreign cities, I know of none that have done so except the capital of Russia, St. Petersburg, where the children also receive drugs in school during the time of recess.

Another system, introduced in 1896, is that of the German city of Wiesbaden. Of this system I shall give some characteristic details, because it attempted an economical medical inspection, and has had much influence on the development of medical inspection in other German and in foreign cities. Hurried routine inspections are made of children entering school in the first days, and are followed by more careful individual examination in the next six weeks, in order to find out which children need to be further held in view. The latter children have, on their health form, the remark "under control." At each of the doctor's fortnightly or three-weekly visits at school, a

number of these children are inspected, and others are sent to the doctor by teachers, or selected by the doctor himself during his visits to schoolrooms. The whole school population is reexamined only in the third, fifth, and eighth; that is, the last school year. In this way, much time and money is saved; and the advantage of following up individual children needing attention is a great one, when weighed against the possibility that others than the "control children," needing examination, may, in spite of the doctor's visits to the schoolrooms and the teachers' care, escape notice. As to treatments, the results obtained are not very great; of all the parents advised to seek medical help, about half do so. In the German city of Halle, where medical inspection on the Wiesbaden plan is well carried out, the percentage of parents following the doctor's advice is larger; in 1910–11, 74 per cent of the 1,278 communications to parents were acted upon. The capital of Sweden, Stockholm, has a remarkable specialistic examination joined to the three general examinations; in addition to existing general and special polyclinics, dispensaries, and surgeries, several public school clinics and a dental clinic have been started. About two-thirds of the children needing treatment have been sent to specialists. Bathing is obligatory, and may be had free of charge.

Different cities, after the routine inspection and first examination of children entering schools, also make later a specialistic one as to vision and hearing. In Bradford, England, since school clinics have been instituted, all questions except that of care for clothing of poor seem to be solved. The child is examined only three times during school life. Children needing treatment are reinspected in two months after inspection, to see whether treatment has been carried out, and care is taken that no child, be it treated by a private physician or in the school clinic, shall escape. Otorrhoeic and rhinorrhoeic children are excluded from school and examined weekly at the clinic; daily syringing is performed by a nurse.

In the capital of Finland, in Helsingfors, an examination of children entering school and four examinations during the school year for all who need special attention are made. Three times a week the doctor must inspect every school under his care and, therefore, has much opportunity to discover those children with newly developed ailments. There are plenty of clinics in proportion to the population[1] and all general and specialistic treatment may be had free of charge. Ninety-one per cent of all children needing treatment are treated. As far as I know, this is the highest percentage anywhere reported in a city.

There can not be any doubt that more frequent and careful examination, leading to the detection of every ailment and case of defect and the provision of facilities for treatment, will bring about greater

results to individuals. Following up cases to secure treatment is a great essential and, if I had to choose, I should prefer fewer examinations and more attention to the treatment of the examined.

Different cities content themselves with a smaller number of individual examinations than the cities thus far discussed. Berlin makes generally only one examination, at the entrance of the children to school, and issues health forms only for children "under control," to insure their being examined repeatedly by physicians who visit each school four times a year. The glorious story of the complete extermination of ringworm in Berlin, after some cases had arisen, is generally known; also glorious is the story of the extermination of this disease, not in this case a new development, in Paris, where it was stamped out by the help of the Lailler school at the hospital St. Louis. The City of Mexico has a similar institution.

There is no doubt that the economical Berlin system also produces results in the treatment of individuals, though probably not in a high percentage of cases; unfortunately, the official reports there, as well as in many other cities, give no general statement as to percentage treated or children needing treatment or as to results obtained.

A further step in economy has been made in Breslau, Germany. Here, as in Berlin, only children entering school are examined. Where, however, Berlin excludes only healthy children from further examination, Breslau excludes also children who are classed as "invalids;" that is, as incurable. As a result, out of 2,000 children under one physician's care, there are less than 300 children entering school to be examined, and only about 200 children "under control." In order to still further save time, parents are not invited to be present at examinations, as is customary, but, with this economy of time, there is a regrettable loss, even though parents are asked to fill out, and generally do fill out, a form giving their observations as to the children's earlier life. (In 1909–10, of 1,650 such forms, 1,193 were filled out.) The results to individuals of such an economical system must necessarily be modest ones. I found, from the annual reports of the years 1905–6 to 1910–11, that, on an average, only about 20 per cent of the elementary school pupils with ailments or defects were treated. I suppose, however, that "invalids" or incurables are included in the statistical sum of the total of ailing children. During the same period 6,578 letters were sent to parents and 38.6 per cent of them came back with the answer of a physician who had treated the children in question. In this total, I think, are to be included children needing treatments from more than one cause so that, altogether, though I can not get a clear view, it seems to me that the percentage of children needing treatment who were treated can not be a very high one. A further diminution of routine is the examination of those only who are noted as ailing, on a form filled out by parents

or by teachers; the first method having been introduced into Meissen, the second into Gera, in Germany.

As concerns treatment in connection with examination by the medical fraternity it must be remarked that poor people generally have no family doctor and do not seek treatment of their own will except in acute circumstances.

There are also examples of very good arrangements which cost the citizens of the place in question little or nothing. In Berndorf, in Austria, two hours by rail from Vienna, examination of every child in the little manufacturing town is required at least once a year; those "under control," or about 44 per cent of all children, are examined three or four times a year. There is every facility for specialistic treatment, gratis or almost gratis, according to the financial condition of the parents; an excellent school clinic and a fine school dental clinic have been established; these are attended by specialists coming from Vienna. Home treatment is given free of charge to the indigent; rate payers contribute a very small sum.

In Dunfermline, Scotland, half an hour's journey from Edinburgh, the examination of all children four times during school life is obligatory; there are excellent clinics, general and special, as well as other up-to-date arrangements for treatment. The school clinic works free of charge for every child coming with the consent of a private physician. The county council pays half of the cost of medical inspection; rate payers have nothing to pay.

In Berndorf, while the town nominally pays the expenses, Mr. Arthur Krupp, proprietor of the large manufactories in the town, actually pays the greatest part of all taxes, and therefore most of the expense of medical inspection, besides doing other beneficent work. Dunfermline is the birthplace of Mr. Andrew Carnegie, who presented it with funds which yield an income of about $122,000, of which the trustees very wisely invest large sums in promoting health.

I have referred here with special pleasure to these examples, because in no country in the world does wealth, so often and on such a large scale, show noble common sense as in the United States. Therefore, we may hope that the Carnegie and Krupp systems of starting medical inspection, with efficient equipment for securing results, may prove an object lesson to generous citizens.

The greatest difficulties in the way of securing effective medical inspection are found in very large cities and rural areas.

London, with an elementary school population of 750,000, has a medical male and female staff, giving the equivalent of 19 whole-time physicians and 51 nurses. In 1910 arrangements were made with 13 hospitals for treatment of 33,000 children for eye, ear, and throat affections, and ringworm. The London county council paid

nearly half a dollar (2 shillings) a head for the children treated and in addition about $243 (50 pounds) for half a day a week spent by every one of the treating practitioners. The rate paid for treatment by the family varies according to income, free treatment being given in case of need. These arrangements, expensive in comparison with the results secured to individuals, can only be of a temporary character, for in such a large city this system involves too much loss of time, and its control is difficult. School clinics answer the need better; in 1908–9 four such were started in London by different means. In connection with each school a care committee is appointed to deal with individual cases. It is quite impossible to go into details with regard to the methods of the largest city in the world.

The second set of difficulties in the way of medical inspection constitutes the rural problem, the solving of which is in the experimental stage. It is well known that mandatory State regulations, such as those of Minnesota (1910), or of Pennsylvania (1911), make exceptions for districts with scattered population or for remotely located places. Distances are great, physicians rare, specialists almost unknown. Roads are sometimes in a bad state, and, in consequence of the distances to hospitals, there is a great loss of time involved in seeking treatment; moreover, the population, like the poor in great cities, is not accustomed to seek medical help except in acute circumstances.

Inspection generally will be accomplished in rural districts only on a reduced scale, in comparison with good city systems, by traveling whole-time assistants or by settled rural practitioners who know the families, their conditions of life and hereditary influences; the aid of trained district whole-time nurses, possibly also of midwives with some training in nursing, may be utilized. Of special value will be the efforts of teachers to persuade parents to secure treatment. If cases are to be followed up by every possible aid, treatment centers at convenient distances, as well as flying clinics, will be of great practical help.

An experiment in the direction of using both rural practitioners and whole-time assistants was arranged in 1911 for Ailesbury, in England; similar arrangements are made in the little German State of Saxe-Meiningen, already referred to.

In the county of Hertfordshire, in England, covering about 600 square miles, are 13 rural districts, with 157 schools. The children are inspected generally three times during school life; in a few cases only once or twice. The inspector carriers with him scales, ophthalmic lenses, Snellen types, colored wool, and tongue depressors. In comparing results of the reports for 1909 and 1910 it becomes evident

that there has been individual profit to both city and country children suffering from a number of defects. Almost the same percentage of parents attended first inspection of children in rural as in urban districts.

Derbyshire, in England, is a prominent rural district. In addition to urban schools there are 290 rural ones, with an enrollment of nearly 90,000 children. Those entering and those leaving school are examined; also cases presented by teachers. One month after the inspection parents who have not sought treatment receive a second letter, and if, after another month, they have done nothing, the local manager is asked what further can be done. From the single items of the reports it is to be seen that results to individuals have been attained in a remarkable number of cases, though varying greatly in the different districts. Treatment is mostly given in the hospitals. Much progress is expected to result from the institution of a "providential club" with an annual 6-pence contribution of parents for every child.

Leaving out of account the question of acute infectious diseases, the aims of modern medical inspection are three: The first is to insure the child from injury by unhealthy school premises, including print of books and various school appliances; the second is to make an individual examination of each child, with the view to finding out what should be provided in the school in order that the child may not be injured or that it may better follow instruction; the third aim is to make provisions so that treatment can readily be secured for all needing it, since schooling itself is a part of the cause of the ailings and the defects in question.

The pursuit of this third item involves a very difficult task, and that not only because of the expense involved. Experience has shown that the cordial interest of teachers, and the practical help of the excellent London institution (1901) of the trained school nurses, are most valuable means of promoting treatment. Some means of forcing parents to search for or to permit treatment should be everywhere provided as the last resort.

The extent to which the rights of the weak are safeguarded is a measure of the culture of any community. At the Sixth International Congress on Hygiene and Demography, in 1887, in the medical school inspection section there was proposed a motion, conclusion, and resolution to the effect that the aim of medical inspection is to counteract the injury to the health of children resulting from school attendance and instruction. I proposed an amendment (which was adopted) that medical inspection should work also toward the end of improving the children's state of health. I think it is a suggestion worth considering that, in addition to seeking to advance religious feeling, morals, and knowledge in a child, and in addition

to paying attention to the individual child's state of health in connection with school work, the school should take up, as its principal aim, the development of healthy individuals. This would be to the interest of the individual, the family, and the commonwealth.

I have only been able here to refer in a brief way to some few phases of these vast and important subjects. If what I composed months ago is not in every detail up to date, I offer my apologies.

[1] There were in 1910, 17 clinics and about 153,000 inhabitants.

SOME IMPORTANT ASPECTS OF EFFICIENT MEDICAL INSPECTION OF SCHOOLS—A SCHOOL MAN'S VIEW.

WILLARD S. SMALL, Ph. D., Principal Eastern High School, Washington, D. C.

The beginning of medical inspection of schools in this country was in Boston in the year 1894. It was for the detection of cases of contagious diseases in the schools, in the interest of better protection of the public health. Other cities quickly followed suit. At the present time, 20 States have State laws relating to medical inspection of schools, and over 400 cities have medical inspection in more or less successful operation.

The broadening of the scope and purpose of medical inspection of schools is as striking as its geographical extension. To its work with infectious diseases was quickly added the work of caring for skin diseases and uncleanliness. Next it began the examination of children for the discovery of defects and infirmities that retard development and reduce the school efficiency of children. Soon it essayed the task of examining all pupils, not only for the purpose of diagnosing seriously defective conditions, but also for the purpose of charting, as it were, the physical values of all pupils. Coincident with this work of examination and investigation has developed an appreciation of the real significance of medical inspection. Its true mission is seen to be the general upbuilding of the health of children in school. Medical inspection is fast becoming health supervision.[1] It is formulating a comprehensive program for the conservation of the health and efficiency of children in the schools. It is organizing agencies not only to remedy defects and to effect cures, but also to improve the hygienic conditions of school life.

It is the purpose of this paper to illustrate some aspects of efficient constructive work.

Medical inspection has pretty fully solved the problems incident to the control of communicable diseases in the schools—both infectious and parasitic. In either case competent and frequent inspection is of primary importance. The daily inspection, by doctor or nurse,

of suspected cases, referred by the teacher, must be supplemented by a careful weekly inspection of all pupils. This insures immediate detection of all cases of disease in the schools. Prompt disinfection of classrooms, and a sane policy of exclusion and quarantine, almost always prevent epidemics of disease.[2] In Orange, N. J., where there is weekly inspection of all pupils by the school nurse, "no schools have been closed on account of an epidemic of disease" in the two years during which medical inspection has been in force.

In Newark, N. J., in 1910–11, the number of school buildings quarantined was 50 per cent less than in the preceding year. This was coincident with the increase in the medical inspection force that made possible a monthly inspection of all pupils. The method commonly in vogue, of having the medical inspector inspect irregularly only such pupils as are referred by teachers, is insufficient. A careful inspection of all pupils as frequently as once a week is required.

The function of medical inspection is to keep pupils in school, not to turn them out, but to keep them in school without injury to others or to themselves. In the early days of medical inspection wholesale exclusion of children with vermin and parasitic skin diseases was the rule. The common practice now is to reduce exclusions to the minimum.

In Philadelphia, in 1904, 7,071 exclusions were reported for pediculosis and 2,486 for scabies, ringworm, and impetigo; in 1910 exclusions for the same causes were 1,644 and 973, respectively. Every report I have examined shows a decrease in pediculosis, scabies, ringworm, and impetigo. This commonly means that only flagrant cases are excluded. All mild cases are taken care of by the school nurse.

Newark is a good example of effective handling of this part of the work of medical inspection. The nurse "has entire charge of all cases of pediculosis and uncleanliness," and she also looks after the treatment of "ringworm, scabies, favus, impetigo, molluscum contagiosum, conjunctivitis, infected wounds, and contusions." Emergency cases she treats at the school. She directs the home treatment. A notice is sent to the parent when treatment is necessary. If attention from a physician is not required, a "direction and prescription slip" is sent.[3]

She keeps watch of each case. If home treatment is not attended to, she goes to the home and instructs or exhorts the mother, as the case may require.

In 1910–11 the nurses' report shows that 6,212 cases of pediculosis were treated, with 619 exclusions; 2,304 uncleanliness, with 40 exclusions; and 35,976 cases of the eight diseases named above, with

only 40 exclusions. Newark is typical of a considerable number of cities that are handling this part of medical inspection in such a way as to hold in school most of the children who are suffering from these minor affections, while at the same time improving their physical condition. Exclusion is resorted to only in cases so flagrant as to be a menace or a nuisance.[4]

In all places where medical inspection is progressive, provision has been made for the physical examination of pupils. This begins as a special examination of pupils who obviously have "defects that retard school progress." This is followed by a demand for an annual examination of all pupils, the examination to include not only the detection of defects, but also to serve as a "record of growth and development." In Milwaukee, Rochester, and other cities "an attempt is made to examine every child annually." This ideal generally is not realized because of the insufficient force in the medical inspection service. In New Jersey a State law requires that in every school district "the medical inspector shall examine every pupil to learn whether any physical defects exist, and keep a record from year to year of growth and development." This contemplates an annual examination. Several New Jersey cities are working toward this end. In Newark it is required that "a physical examination shall be made of every new pupil when enrolled, and, as soon as possible, of every pupil in school. About three-fifths of all pupils were examined last year." Trenton reported the examination of nearly all in 1910–11. Orange, N. J., reports that in 1909–10 and 1910–11 "practically every public school child below the high school was examined." In Canton, Mass., where a nurse is the medical inspector, there is an annual examination of all pupils.[5]

The scope and manner of the Orange examination are as follows: "Each eye is tested separately, using the Snellen chart at 20 feet. Presence of blepharitis, iritis, conjunctivitis, or any other affection of the cornea is noted. Each ear is tested separately by whispering at 20 feet. The presence of a discharge from either ear is watched for and noted. Defective teeth, adenoids and enlarged tonsils, and an enlargement of cervical glands are noted. The general condition of nutrition, and any deformity of the spine, the chest, or extremities are recorded, and when necessary an examination is made of heart and lungs." This examination is satisfactory, except that it neglects measurement, of height, weight, and lung capacity—which measurements are essential to a "record of growth and development." Trenton, Newark, Rochester, Milwaukee, in fact, most cities that give a physical examination, include such measurements. The Rochester examination includes also "mentality."

An adequate permanent record is necessary. The card should contain not only the examination data for each year of the school course, but also the essential facts in regard to the child's home environment, history of illness he may have had, summary of his school record (attendance, conduct, effort, profficiency), and (on the back of the card) diagnoses of any infirmities found and recommendations and results.

Dr. Barth, of Milwaukee, states that this record card goes with the child, so that "whenever a child is placed under a new teacher she is thereby informed of any defects the child may have." She will place the child in the room under conditions as favorable as possible for success in his school work. Dr. Goler, of Rochester, contemplates a broader use: "The card is designed to accompany the child from grade to grade, and is to be presented to the issuing officer for work permit if the child wishes to go to work; otherwise, it is intended to follow the child into the high school." It is a "certificate of physical fitness to enter high school or college." Such a physical record, paralleling the school record, serves, in many cases, to interpret the school record. It is also an index of the physical education needs of individual pupils. Again, these records, studied collectively, may be an index of the hygienic conditions of the school. If, e. g., the records were to show a progressive frequency of any defect or disability for which any phase of the school procedure or environment might be responsible, investigation should be made. There are doubtless some subtly unhygienic factors in the ordinary methods of instruction.

The primary object of physical examinations is the discovery of infirmities and defects. The object of the discovery, however, is that they may be remedied. A notice to the intelligent and solicitous parent that the child probably needs medical attention is sufficient. But the majority of defective children are children of poverty. Poverty is the matrix of disease and defect. Ignorance is their nurse. The indifference of parents is born of ignorance. Medical inspection must do battle with poverty for the health and happiness of helpless childhood. Its weapons are persuasion and instruction. Its only compulsion is the moral compulsion exerted by wise and sympathetic and persistent persons. In this field success depends almost absolutely upon the school nurse.

An experiment was made in Philadelphia in 1910 in which "eight schools of about the same character and equipment were selected. In four of these school nurses worked regularly; in the other four, not. At the end of the first half year it was found that in the schools where nurses worked results were obtained in 90 per cent of the recommendations of the medical inspectors; in the four schools that had no

nurses results were obtained in only 25 per cent of the recommendations." In Newark, after one year, with a wholly inadequate number of nurses, Dr. Holmes was able to report "an immediate and large increase in the number of cases treated and a reduction of retardation due to physical infirmities."

Statistical comparisons of the relative efficiency of medical inspection systems are practically impossible, because of the lack of uniformity among such systems, both in the kind of data presented and in the method of presentation.[6]

The most adequate report in this respect which I have found is that of the medical inspector of Orange, N. J. (1911). The form of statement is unsystematic, but certain important facts are given for the two years during which medical inspection had been in force. The total number examined, number found normal, number abnormal, number sufficiently abnormal to need treatment, number that received treatment (proper care and attention), number that neglected or refused treatment. Summarized in tabular form, these figures show at a glance the measure of success and failure in improving the health of the defectives:

Year.	Number examined.	Normal.		Abnormal.		Recommended for treatment.					
								Treated.		Not treated.	
		Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
1909–10...	3,606	2,481	69	1,125	31	461	13	323	70	138	30
1910–11...	3,808	3,500	92	308	8	196	5	102	52	94	48

It is shown that in the first year 70 per cent of those needing treatment "received proper care and attention;" that in the first year 13 per cent of all the children examined (which was all in school) needed treatment, but only 5 per cent in the second year; and that, whereas at the end of the first year 138 pupils needed treatment who had not received it, at the end of the second year there were only 94. The report states that nearly one-half of these 94 were cases left over from the preceding year, "children over whom we shall have to work for years until the parents are educated to the point of acknowledging their children's defects or until their financial condition allows them to consult their own physician instead of going to a dispensary as a charity patient." These cases are evidently not regarded as "closed." They are to be pursued until properly treated. The problem is not medical, but social and educational.

One or two crude comparisons are possible. The Newark report for 1911 gives the following data:

Year.	Number examined.	Normal.		Defective.	
		Number.	Per cent.	Number.	Per cent.
1909–10	8,483	2,580	30.5	5,903	69.5
1910–11	24,310	9,356	38.5	14,954	61.5

The percentages of normal and defectives may be compared with Orange:

Year.	Per cent normal.		Per cent defective.	
	Orange.	Newark.	Orange.	Newark.
1909–10	69	30.5	31	69.5
1910–11	92	38.5	8	61.5

It is to be noted that, whereas in Orange all the public school children were examined, in Newark only one-fifth were examined in the first year and about one-half in the second year. This means that those who were examined were for the most part children who were suspected of defect. This accounts in large part for the disparity in the percentages of normals and abnormals. On the other hand, the tripling of the number of examinations in the second year means that the examination was not limited to probable defectives, but in some schools included most, if not all, of the pupils. This alone would suffice to account for the reduction in the percentage found defective. This would imply, of course, that a relatively small number of those found defective in the first year had received attention. Even if we should assume that all of the children examined in the second year were suspected of defect and that the other one-half of the school enrollment were probably normal, we could then only reverse the figures for normal and abnormal, 61.5 and 38.5 per cent, respectively, instead of vice versa. The disparity in the number of abnormals would still be striking—nearly five times as high in Newark as in Orange. Allowing for differences in the social character of the two communities and for different standards of "abnormality," this statistical evidence points plainly to the conclusion that in the one case remedial results were generally secured and in the other case that such results were much less generally secured. In respect to this matter, medical inspection is efficient in the one case and inefficient in the other case.

The important difference in organization is in the relative number of nurses employed. Orange has one nurse for every 2,000 pupils;

Newark has one nurse for every 6,000 pupils. In Trenton, with one nurse for 6,000 pupils (approximately) the significant fact shown by the statistics is, according to Supt. Mackey, that "there are so many cases reported to the parents as needing medical attention that do not receive it." The report of every city where the number of nurses is inadequate tells the same story. The nurse is the live wire, in this part, at least, of the work of medical inspection.

The constructive character of the nurse's work is shown in a statement by Dr. Hoag, of Berkeley, Cal. The nurse showed parents how to construct a cheap sleeping porch; instructed mothers in regard to proper food (she found many children who were drinking from one cup to 3 pints of coffee a day and, in many instances, succeeded in correcting the evil); provided means for medical and dental treatment where parents were financially unable to do so; showed many mothers how to treat minor ailments; frequently found conditions in the home environment that fully explained infirmities revealed in the physician's examination, and, in many instances, adjusted the difficulties. Her intimate knowledge of the relation between home health and school health is invaluable. The following quotation from a letter from Supt. Mackey, of Trenton, is significant, as showing the matured conviction of an exceptionally capable school superintendent:

> The most interesting results of our system of medical inspection, I think, are not to be found in our tables of statistics, but rather in the reports of individual cases and especially in the work of the nurses in the homes and in mothers' meetings in their respective districts. For example, a nurse at a mothers' meeting gave a demonstration to show how to bathe and care for a sick child. One of the mothers at this meeting learned from the demonstration how to take care of her children when three of them were down with scarlet fever, and it was the report of the family physician that the children owed their recovery entirely to the skill and care of the mother. One of our nurses has given in several neighborhoods a demonstration of bathing and feeding a baby. The meeting was attended by 35 or 40 Italian mothers, each with one or two very small children, and it was inspiring to note with what intense interest they watched every movement of the nurse as she undressed, bathed, and dressed a baby and showed how to prepare and take care of its milk. Everything was explained also to these mothers by an interpreter. Perhaps even more important work has been done by the nurses in their visits to the homes of the children—the conditions of squalor and filth that have been remedied, and the children cleaned, cured, fed, and sent in decent condition to school.

Plainly, medical inspection as a "comprehensive program for the conservation of the health of children in school" is social and educational. Two important factors in the realization of the program are: (1) The organization of systematic cooperation with such existing social agencies as hospital and dispensaries. (2) The development, either within or without the school system, of new social and educational agencies, as are shown by experience to be necessary.

In medical inspection reports, there is constant reference to the cooperation of clinics, dispensaries, etc.:

The nurse provides means for attention to medical or dental conditions that would otherwise be neglected. Children needing the attention of a specialist, and unable to pay for it, are taken by the nurse to a public clinic.

Dr. Barth, of Milwaukee, states that the agencies by which defects are remedied are the—

dispensaries, children's free hospital, and the free dental clinic run in connection with my office. The board of school directors have also placed a fund of $500 at my disposal for the purchase of eyeglasses for children of indigent parents. Practically all the doctors of the city are willing to treat children free of charge, if it is so recommended by the department.

In a published statement Dr. Barth states that—

the department maintains a close relationship with all the charitable and relief organizations of the city and through their agency is enabled to satisfy many little hungry mouths and clothe many shivering bodies. Bad housing conditions are reported to the health department for investigation. Cases of parental neglect or abuse are taken up with the juvenile court. Thus the department comes into touch with all civic problems of health and happiness. Its opportunities for doing good are enormous.

The Philadelphia report for 1910 shows that of 142 children found suffering from malnutrition, 89 were sent to the country through cooperation with the appropriate charitable agency. In almost every report I have examined, cooperation with the antituberculosis association is reported. In many places free dental clinics have been established by the dental association, at the instance of the departments of medical inspection. In Milwaukee and Philadelphia, though maintained by the dental societies, the clinics are located in the city hall, and have an official connection with the department of medical inspection.

What is needed in every city is organized systematic cooperation, so that time and energy may not be wasted.

It is beginning to be seen, however, that real economy of time and effort demands that much of this work be done within the school. It is already common for the school nurse to take care of most of the minor ailments. This work needs to be extended and systemized. Dr. Holmes, of Newark, has aptly stated the case for a general school clinic: A large majority of the public-school pupils who are found suffering with diseases and defects receive free treatment at the free clinics which are attached to hospitals. Frequently, in such cases, the parents are able to pay, but the hospital has no way of knowing. The hospital clinics, too, are generally held in school hours, so that going to the clinic means loss of school time. As the nurse frequently has to go with children, the waste of her time is considerable.

Finally, and most important, the treatment of cases in school by the nurses has grown to such proportions as seriously to interfere

with classroom inspection and home visiting. This is a grave misfortune, as it is only through following up the serious cases in the home that results are obtained after recommendation by the physician. Furthermore, much of the nurses' time is wasted, in this follow-up work, with parents who delay and shilly-shally, but who would permit immediate action if a clinic were connected with the school. There should be a properly equipped school clinic, open daily, except Sunday, from 3 to 6 p. m., and conducted by the medical-inspection corps. Only school children should be treated. Admission to the clinic should depend upon a certificate stating that the pupil had been referred by a medical inspector for treatment, and that the nurse had visited the home, and had found that free treatment was necessary and right. Such a clinic would effect an enormous saving of time for nurses and would eliminate pauperism—for the essence of pauperism is not the acceptance of free service when there is no other way; it is the seeking of gratuities when not in need of them. "In our large cities it is ever becoming more and more difficult for the child of the poor to grow to manhood or womanhood with a healthy normal body. In my judgment, the public school and its force should be ever mindful of the physical health and growth of the children in its vicinity."

Dr. Holmes speaks as though he expected this plan to be adopted at no distant date. There are symptomatic approximations in a number of places. The school physician in Berkeley, Cal., has a "consultation office," open three afternoons a week. Parents are urged to consult. Thorough examinations are made, parents are fully advised, and arrangements are made for treatment, if parents are unable to pay. In New Jersey, city councils are authorized, by State law, to appropriate not to exceed $5,000, to maintain a dental clinic for the schools. Several cities have established clinics under this law. In Philadelphia, the Bureau of Health and Charities maintains a division of ophthalmology. Most of the work is with school children. Such actual achievements suggest that the school clinic is not an "iridescent dream."

Another important field of work is opening to medical inspection—the supervision of the education, in its medical aspects at least, of the various classes of defective children for which special provision is fast being made in public-school systems. Medical inspection is initiating and directing the open-air schools for tuberculosis and anemic children in many cities. Dr. Holmes, of Newark, makes a logical plea for special classes for children suffering from trachoma:

> During the year 1909–10, one hundred and seven cases of trachoma were found in the public schools; in 1910–11, one hundred cases. This meant indefinite exclusion until these pupils were cured. Such loss of attendance is a needless hardship. If a special room were provided for them, they could, with few exceptions, continue their education while under treatment.

Newark, Milwaukee, Philadelphia, and other cities report responsibility for the examination and classification of backward and feeble-minded children. Dr. Holmes's statement will serve as an example:

> The board of education established last year five classes for feeble-minded pupils. The selecting, classifying, and diagnosing and prognosticating of such cases fell to some extent on the department of medical inspection. There is great need of care in selecting, classifying, and diagnosing the cases, as it was found that these special classes were composed of a great many hopeless idiots who could not profit by any instruction and were surely institutional cases. Examination of all the pupils in these classes showed a number of physical defects, which, when removed, improved the comfort and prognosis of these pupils.

In Milwaukee the supervision of special classes for the blind and the deaf, at least in its medical aspects, rests with the department of medical inspection.

The development of this kind of work means the addition of specialists to the medical-inspection corps. Milwaukee, Rochester, Philadelphia, and other cities report the employment of specialists.

The development of medical inspection of schools is steadily in the direction of constructive hygiene. The facts and examples I have cited are illustrations of important factors in the organization of a program of health conservation in the schools. The most significant things in this program are seen to be not diagnosis, as important as that may be, but the development and organization of the social and educational agencies.

---

[1] Mr. L. Rapier, of New York, has recently made a study of medical inspection in 50 cities of the country. He has personally visited 25 cities. The results of his investigations are shortly to appear in a book. He has published two brief but important papers: "Medical supervision of schools," in American Education, April, 1912; and "Tentative standard plan for the medical supervision of schools," in School and Home Education, May, 1912. He criticizes constructively the administration of medical inspection. His forthcoming volume should exert a formative influence in the reconstruction of medical inspection.

[2] Exclusion of pupils is sometimes overworked. The Report of Superintendent Verplanck, of South Manchester, Conn., 1911, suggests such a case.

[3] All such "home" notices and instructions must be couched in simple and untechnical language. School physicians frequently seem not to understand this.

[4] The State law of New Jersey provides that a parent or guardian who refuses or neglects to carry out directions in regard to contagious disease or cleanliness may be punished as a "disorderly person."

[5] See School Inspection in Small Towns, by Dr. A. Cabot. Boston Med. and Surg. Jour., May 4, 1911, Vol. CIXIV, No. 18.

[6] Most of the statistical reports are for the purpose of exhibiting the amount of service performed, not the results secured. Where results are shown, it is on the basis of the number of different ailments treated rather than the number of children improved.

WHAT MEDICAL INSPECTION OF SCHOOLS CAN DO FOR THE TEACHER.

HELEN MACMURCHY, M. D., Toronto, Canada.

What the teacher thinks about the medical inspection of schools makes a great difference to the success of any attempt to establish this state partnership between education and medicine. If the medical inspection of schools is to be really useful, we must, first of all, find the right doctor specially qualified to take charge of the work. Then that work must be organized. And it must stand the test of daily experience. We must be able to see that the children have better health and make better progress. Otherwise, Cui bono? Who is the judge of this? The teacher. This teacher, who is at once our help and our judge, leads the strenuous life.

"Most readers," says the manuscript of Mr. Pattieson, "must have witnessed with delight the joyous burst which attends the dismissing of a village school on a fine summer evening. The buoyant spirit of childhood, repressed with so much difficulty during the tedious hours of discipline, may then be seen to explode, as it were, in shout and song and frolic as the little urchins join in groups on their playground and arrange their matches of sport for the evening. But there is one individual who partakes of the relief afforded by the moment of dismission, whose feelings are not so obvious to the eye of the spectator, or so apt to receive his sympathy. I mean the teacher himself, who, stunned with the hum and suffocated with the closeness of his schoolroom, has spent the whole day (himself against a host) in controlling petulance, exciting indifference to action, striving to enlighten stupidity, and laboring to soften obstinacy; and whose very powers of intellect have been confounded by hearing the same dull lesson repeated a hundred times by rote, and only varied by the various blunders of the reciters. Even the flowers of classic genius, with which his solitary fancy is most gratified, have been rendered degraded, in his imagination, by their connection with tears, with errors, and with punishment; so that the eclogues of Virgil and odes of Horace are each inseparably allied in association with the sullen figure and monotonous recitation of some blubbering schoolboy. If to these mental distresses are added a delicate frame of body and a mind ambitious of some higher distinction than that of being the tyrant of childhood, the reader may have some slight conception of the relief which the solitary walk, in the cool of a fine summer evening, affords to the head which has ached and the nerves which have been shattered for so many hours in plying the irksome task of public instruction." (Walter Scott, in Old Mortality.)

If we are to understand what medical inspection of schools can do for the teacher, we must follow the example of that ancient Hebrew statesman and sociologist who came to Tel-abib to visit the children of the captivity. "I sat where they sat," he says.

To-day the teacher is still "stunned with the hum" of the schoolroom and suffers its "closeness." Medical inspection must improve schoolroom air.

As for "shattered nerves," we, who know so much about the neurasthenic and the psychasthenic, realize that preventive medicine has yet to win the victory for those unhappy beings whom we class as nervous patients.

We must show teachers that medical inspection can do something for them by lessening strain, by providing outlook, and by giving the teachers the sense that we are "all with them," that we are all behind them, that we are thinking of providing a "wander year" and better conditions generally for them and their scholars, so that their heads may not ache so often nor their nerves be shattered so frequently. Besides, every teacher meets, sooner or later, the stupid, the dull, the backward, and the sick. They are our peculiar care. The stupid may have adenoids, the dull may only be dull of hearing, the backward may be really feeble-minded, and the sick may be sources of infection to the teacher as well as to the pupils. We doctors know what to do for these pupils. They are heavy burdens to the teacher. Send them to us, for we know what to do for them and how to do it, and we are now appointed by the state and the education authorities for that purpose.

We need the teacher, besides, as an active ally. The school child may be a powerful influence in sanitary reform, as the Hon. Joseph Chamberlain showed in 1894. As a sanitary reformer, the school child, by his influence at home, can get more rapid and more permanent results than any of us. The school doctor, by lectures, photographs, conversations, and personal contact with the teacher, can add immensely to the knowledge and the resources of the teaching profession, and hence to their sphere of influence in the community. We can not ourselves make the school child a sanitary reformer, but we can do it through the teacher, and that is a benefit to the teacher as well as to the community. Knowledge is power.

Light in the schoolroom is almost as important as air. Look at the windows. Probably we all know of instances where the poor teacher suffered, and suffered far more than the pupils (for the pupils stay one term in the room, but the teacher stays for years in the room), from insufficient and improper lighting. Ground glass is an abomination to the eyes. I know a teacher who had to struggle for months, yes, even years, before she could get it taken out for her. The eco-

nomical architect had put it in to save the cost of blinds. The school board saved the cost of the blinds, but who paid for the damage to the teacher's good eyesight? The principal did all he could. The school board met once a month, but it had a lot of business, and large bodies move slowly, especially when it is not the school board's own eyes and head that are aching. Finally, the government inspector came along. The teachers and the principal appealed to the inspector. In due time the inspector reported to his government department of education. The department, in the course of time, sent a copy of this report to the board. The board sent the report to the management committee. The management committee noticed what the inspector said about the ground glass. They recommended the removal of that glass. The board received and approved the report. The work was done the next summer holidays. That was the best time—record time.

But now it would be quite possible to have the glass removed in as many weeks as it formerly took years, because the medical inspector of schools has been appointed to deal with such matters.

The greatest benefits we receive from anything or anybody are not so easily tabulated as are the least benefits. The greatest calamities are those that come unrecognized by ourselves—such as atrophy and hardness of heart. And there is an isolation in the teaching profession and an indefinite and often unrecognized sense of disappointment and limitation that steals in upon the teacher's soul as he or she sees, year after year, the graduates for whom the teacher has done so much enter into the Canaan of a new and wider existence in the great world for which the schoolroom world is only a preparation. In one sense that Canaan of the great world is not for the teachers, as it were. They have to stay in the schoolroom and begin to do it all over again—to drill that six times 9 are 54, and that the genitive of *mensa* is *mensæ*, and that the Nile rises in the Victoria Nyanza, and that Columbus discovered America in 1492, and the freezing point of water is 32° F., and how to solve a quadratic equation, and how to cross the asses' bridge, and how to write a composition, and what the Greek Kalends were, and what Lady Macbeth said that she should not have said, and all the rest of it.

When you have taught these things 200 times you can not save your soul alive by teaching them again. You need some sense of comradeship with your equals, and some community of interests—some recognition of the higher references of life which children (except occasionally by direct inspiration of God) can not give you. We do not claim that the call to the doctor to stand beside the teacher can accomplish all this. But it can help, for the doctor grasps the hand of the teacher as an equal, and says, "What can I do for you?"

And so, while being school doctors, we can certainly bring the teacher better health by giving protection from infection and impure air diseases and from eye strain caused by bad lighting, while we can make the teacher's work easier by improving the child's sight and hearing and breathing, while we can find the mentally deficient child among a hundred or a thousand and relieve the class, the teacher, and the nation by pointing out the absolute necessity of the special class and permanent care in after life for the mentally deficient—though this one thing alone would justify medical inspection of schools—yet the greatest thing we can do, as school doctors, is to remind the teacher and the world that the schoolroom, next to the home, is the most important place in the world. Out of it issues that stream of life which determines national character and national destiny. Those who deal with the making of human beings are doing the greatest work in the world.

The greatest thing we can do for the teaching profession is to help people to see its value and importance, so that better recruits shall enlist in that army, and that we shall pay them by the coin of the realm, and by that coin of public respect, regard, and influence which is more precious than gold. We may thus show a little more light on the larger vision of human life and render the schoolroom walls capable of expansion until the interests and fate of the world shall be thought of there. We may so help teachers to do their best for their pupils in the most scientific way that the tired heart takes courage because a new helper has come, that the weary hand grasps the task anew because greater accomplishment is possible with less effort than of old, and that the eyes, grown dim with too close scrutiny of small things, are lifted up to look at the distant horizon, where dawns a better day for the school and for the world.

A FOLLOW-UP SYSTEM IN MEDICAL INSPECTION.

Dr. THOMAS A. STOREY, of the College of the City of New York.

Active, aggressive health is the most important human resource. This is true because of the determining influence of health upon the success of every human enterprise. It is of supreme importance in its relation to the quality of all physical efficiency and to the value of all mental productivity.

On account of this fact any phase of educational method which develops health intelligence and health habit in human beings is of very great educational and practical importance. This importance is now very generally recognized in our public schools and colleges. Unfortunately, we are far from a unanimous decision as to what is

the best method of instruction along these lines. Too much of our instruction is of the sort that stimulates no response in terms of practical application. Too little of the hygiene learned in our schools is ever used by the boys and girls in their homes. Too little of such hygiene ever becomes habit.

In the department under my supervision we have attempted to secure a method of instruction in hygiene which will develop permanent health habits in the individuals that come under its educational influence. One phase of our work includes medical inspection. We do not like to call this part of our work "medical inspection." We prefer to make it and call it "individual instruction in personal hygiene." In this scheme medical inspection becomes a part of our method of securing information concerning the hygienic needs of the individual and a basis on which the individual may be given advice bearing upon his personal health problems.

Our methods of medical and hygienic examination have been described elsewhere and need not be described here. The important feature in our plan lies in our method of following up our instructions to the individual. All advice and instruction given during medical and hygienic examination is followed up within as short a time as is reasonable. If the individual is found affected by some communicable disease which is a menace to the health and hygiene of his associates, he is required to remove the complaint or leave school. If the individual is found suffering from the influence of remediable incapacitating physical defects, the fact is brought to the attention of his parent or guardian. This notice must be recognized. The pupil must return with evidence that the incapacitating defect is being treated, or he must bring a note from his parent or guardian stating what he plans to do.

Failure to bring such a communication is handled as a matter of discipline. The boy is debarred from all classes until he brings in this note or until he brings in evidence that he is under treatment.[1] If the parent writes that he does not propose to do anything with reference to a condition or a defect that has been reported to him, the fact is noted and the boy is relieved of any further obligation at that time. This is not done, however, until every reasonable effort has been made to place the hygienic importance of remediable treatment before the boy and his parents. The regular examination is repeated each half year, so that such a defect comes under observation twice a year for five years, and the need for treatment is urged at least as many times during that period.

[1] The department will undertake no treatment other than strictly emergency treatment. No physician on the departmental staff has ever secured a private student patient through these examinations.

As a matter of fact, the percentage of parents that refuse to secure treatment is very small. For the year ending June 1, 1911, the number in this class was seven-tenths of 1 per cent, and for the year ending June, 1912, it was eight-tenths of 1 per cent.

The routine involved in following up this instructional advice may be outlined as follows: At the time of his examination each boy is seen by a member of the staff, with all the results of his preceding examination or examinations recorded on cards made out for that purpose. The instructor then goes over the boy's record with him and advises him as to what has to be done and what ought to be done for the improvement of his health habits and his physical condition. As he proceeds with this advice, the instructor makes out a "conference card." This card contains the boy's name, his address, his class and section in the school, frequently his schedule of recitations, and a record of each "diagnosis" for which advice has been given.

The boy himself is given a card which contains a record of the things to which his attention has been called, and a memorandum of the date or dates on which he has been directed to return for conference. Finally, he is given a card containing a communication to his father, with a request for a record of his physician's or dentist's examination and treatment on the back of the same card.

These various cards are so printed as to require a minimum of clerical work in filling them out.

After the boy has received this instruction the conference card is filed away. When the boy returns for conference his conference card is drawn and on it is recorded the fact that treatment has been promised, secured, or refused. If the case can not be closed in this way at this conference, a record is made of the fact that the boy reported, and he is given a new date for subsequent conference.

The file of conference cards is gone over regularly every day or two. All deliquent boys are warned that they should report as directed. This "warning" is accomplished in one of two ways: Either the boy is seen personally in the classroom, or a letter is sent him, addressed to his home. In the latter case, the letter reads that the boy will be debarred from all classes unless he reports to the central office of the school on or before a certain date with a communication from this department stating that he has satisfactorily followed directions. If the boy then fails to report, he is debarred from all classes, and can be reinstated only on recommendation from the department of hygiene.

In those instances in which treatment is promised the cases are followed up at longer intervals in order to secure a record of what is done. By means of this plan the boy is reminded of his promise

at fairly frequent intervals. The success of this follow-up system during the year ending June 1, 1912, may be seen in the following statistics:

	First term.	Second term.
Boys given instructional advice	1,051	936
Diagnoses followed up	1,542	1,409
Conferences necessary to follow up all cases	2,244	1,925
Diagnoses recorded as "Under treatment":		
Number	73	158
Per cent	4.7	11.2
Diagnoses recorded as having "Secured treatment":		
Number	1,298	1,093
Per cent	84.1	77.5
Diagnoses recorded as having "Refused treatment":		
Number	11	10
Per cent	0.7	0.8
Diagnoses recorded as having "Promised treatment":		
Number	108	102
Per cent	7	7.2
Left college:		
Number	40	40
Per cent	3.1	2.7
Parents refusing to secure treatment	9	8
Individuals warned	328	290
Individuals debarred	71	92
Individuals reinstated	67	85
Individuals that remained debarred	4	7
Dentists consulted privately	273	256
Physicians consulted privately	189	139
Opticians consulted privately	22	16
Dental clinics attended	3	4
Hospitals attended	24	14
Students securing private dental service	320	310
Students securing private medical service	204	147
Students securing the service of opticians	15	18
Students securing free dental service	8	13
Students securing free medical service	4	5
Students securing free clinical service (dental)	.....	3
Students securing free clinical service (medical)	10	11
Percentage of students securing private services	96	93
Percentage of students securing free services	4	7
Total number securing private services	539	475
Total number for whom home treatment was sufficient	490	429
Total number securing free settlement	22	32

These statistics justify the following conclusions:

First. Our medical inspection is effective. It is securing the repair of physical defects, and it is correcting unhygienic conditions, in over 90 per cent of the cases under observation. This plan of individual instruction in personal hygiene is improving the physiological efficiency of at least a thousand boys every half year.

Second. Our plan of individual instruction in personal hygiene has met with the support of the parents of practically all our boys. No system can endure without such support.

Third. It is safe to expect that this continued personal relationship, extending throughout the high-school period, and covering the first two collegiate years, will develop permanent habits of personal health control in many, if not in most, of the boys under our supervision.

DISCUSSION.

Dr. CHANCELLOR. We have heard this morning a deal about the inspection of city schools. I have visited the schools of practically

every large city in the land. Almost no States do anything for their rural schools. We may go after the 60 per cent of children in rural and small-town schools by State legislation and county authorities. Some States have made small beginnings.

GEO. J. HOLMES, Newark, N. J.: I agree with Dr. Baker that Dr. Storey's plan of following up is excellent, but that it does not produce such excellent results when applied to public school pupils. The only excuse for medical inspection is that it will correct physical defects, improve the health of pupils, and the sanitation of school buildings. The school nurse is the most valuable agent in correcting defects. It is she who follows the pupil to the home and pleads with the parents to obtain treatment.

There is no part of physical examination that a well-trained school nurse is not fit to carry out effectively, except the examination of the heart and lungs.

Personally I have not a very good opinion of the part-time, poorly paid physician acting as medical inspector.

It must be remembered that free treatment, if offered at all to public school children, must be offered to rich and poor alike; their parents are both taxpayers.

THURSDAY MORNING, SEPTEMBER 26, 1912.

DIE SCHULÄRZTIN AN DEN HÖHEREN MADCHENSCHULEN, EINE SOZIAL-HYGIENISCHE FORDERUNG.

Dr. HELENE FRIDERIKE STELZNER, Schulärztin an den Charlottenburger höheren Mädchenschulen.

Zunächst möchte ich erwähnen, dass der Titel meiner Ausführungen nicht so feministisch gemeint ist, wie es vielleicht den Anschein hat. Er könnte ebensogut lauten "Der Schularzt an den höheren Lehranstalten," wenn er nicht einige wenige Betrachtungen und Beobachtungen enthielte, die speziell aus der Verbindung des weiblichen Arztes mit der Mädchenschule hervorgehen.

Nachdem die Institution von Schulärzten für die Gemeinde-Schulen allgemein unter fühlbarem Mangel an Begeisterung der beteiligten Kreise, der Lehrer und der Eltern sich vollzogen hatte, ist man jetzt nach etwa 15 Jahren soweit nicht mehr begreifen zu können, wie es ohne diese Einrichtung gehen könnte. Nachdem man in den verschiedenen Staaten langsam und zögernd dazu geschritten ist, Schulärzte auch an den höheren Schulen anzustellen, scheint es nicht unwichtig, aus diesen ganz jungen Erfahrungen heraus die Sachlage zu beleuchten, um die sozialhygienischen Gesichtspunkte herauszuschälen und ein ev. Vorwärts in der Angelegenheit anzustreben; denn es handelt sich dabei zweifellos um ein internationale Kreise treffendes Bedürfnis, dem zunächst nur in wenigen Staaten und auch da nur teilweise entsprochen worden ist. Und wenn z. B. bei uns in Grossberlin die neuerbauten Gemeindeschulen mit ihren Bade-, Brause-, and Waschgelegenheiten, mit ihren gut ventilierten Räumen, ihren blühenden Pflanzen und lustigen Aquarien wahre Tempel der Hygiea vorstellen, so glaubt man in den höheren Schulen damit weniger üppig sein zu dürfen, weil die Kinder angeblich das Alles zu Hause haben. Aus derselben Erwägung heraus hielt man auch den Schularzt an den höheren Schulen mehr für einen Luxus- und Repräsentationsgegenstand. Welches Material stellen nun eigentlich die Schüler höherer Lehranstalten dar? In Wirklichkeit sitzen sie durchaus nicht immer in dem häuslichen hygienischen Paradiese, das man für sie anzunehmen scheint, und darum soll auch der Aufenthalt in der Schule, das Schulhaus und alle Schulbedingungen möglichst hygienisch ausgestaltet sein.

In ihren Familien sind häufig gerade nur die Mittel für eine einigermassen standesgemässe Lebensführung vorhanden. Der Arzt

wird in dringenden Fällen gerufen; dauernde ärztliche Ueberwachung findet nicht statt. Der Besuch der höheren Schulen wird nur unter Opfern ermöglicht, um ein Herausfallen aus dem sozialen Milieu, in das die Betreffenden hereingeboren sind, zu verhindern.

Dabei sind die Schulschädigungen an sich an den höheren Schulen viel schwerer zu bewertende; Die allgemein höher gestellten intellektuellen Forderungen, die grössere Stundenzahl, die längere Dauer der häuslichen Arbeitszeit, die Erweiterung der Schulstunden durch Musik- und andere Stunden und nicht zuletzt die mit Erwekkung des Bildungstriebes einhergehenden Vergnügugen, die sogenannten Mussestunden, die aber eine geistige Anspannung bedeuten, Lesen, der Besuch von Museen, Theatern, Konzerten, das Hören von Vorträgen u. a. m.

Angesichts dieser Tatsachen erscheint Anstellung von Schulärzten an höheren Schulen dringend notwendig, und es muss Wunder nehmen, dass, soweit es sich um die europäischen Kulturstaaten handelt, dieser Forderung noch recht wenig entsprochen ist. Wie die Verhältnisse in Amerika liegen, hoffte ich hier zu hören. Asien ist uns mit seinen Einrichtungen in Japan jedenfalls voraus. In Ungarn und Bulgarien sollen nach Leubuscher die höheren Schulen mit Schulärzten vielfach versorgt sein. Die Petersburger Gymnasien sind offenbar in vorzüglicher Weise bedacht. Auch Skandinavien tut sich in dieser Richtung bedeutend hervor. Schweden hat vielleicht am längsten Versorgung der höheren Schulen mit Schulärzten eingeführt. Ich erinnere an die schönen Arbeiten von Axel Key, die sich in gleicher Weise mit den höheren wie mit den Volksschulen befassen. In Deutschland ist noch wenig geschehen, und die Schweiz, die sonst in Schulsachen an der Spitze marschiert, hat zunächst, wie ich durch den Züricher Schularzt im Hauptamte Dr. Kraft, erfahre, im Kanton Zürich Anstellung eines Schularztes an der dortigen Kantonalschule, die unseren Gymnasien entspricht, beschlossen. Den ersten Versuch, eine Schulärztin anzustellen, machte Charlottenburg vor 8 Jahren an den höheren Mädchenschulen. Zunächst folgte Hannover, dann Breslau, das bereits 2 Schulärztinnen beschäftigt. Wien ernannte eine Schulärztin an den Wiener Fortbildungsschulen und kürzlich eine zweite an der K. K. Zentralanstalt für Frauengewerbe. Schulärztliche Berichte von höheren Schulen sind im allgemeinen bisher nur wenige [1] erschienen, umfassende von höheren Mädchenschulen noch gar nicht,[2] und wenn ich den Mut habe, mein kleines Material hier zu publizieren, so geschieht es aus der Erwägung heraus, dass dieses ein zwar eng begrenztes ist, immerhin aber den Vorzug bietet, dass es 8 Jahre lang ein und derselben Person zur Beobachtung unterstand. Unter diesen Verhältnissen ist es wohl möglich auch mit kleinen Zahlen zu gewissen Gesetzmässigkeiten und Ausblicken zu gelangen, die allgemeine Wertung haben und bestimmt sind im Gebiet der sozialen Hygiene einen Platz auszu-

füllen. Liegt doch der Nachdruck der Schulgesundheitspflege bei höheren Schulen ganz besonders nicht in der schulärztlichen Versorgung des Einzelnen, sondern in den dabei zu Tage tretenden volkshygienischen Forderungen.

Mein gesamtes Material setzt sich zusammen aus den Schülerinnen zweier bereits vor 8 Jahren, als ich meine Beobachtungen begann, fertig aufgebauten, zweier sich während dieser Zeit aufbauenden höheren Mädchenschulen und einem angegliederten Gymnasium. Eine fünfte Schule, die ich ärztlich zu beobachten habe, ziehe ich hier nicht in den Kreis meiner Betrachtungen, da es sich um wesentlich andere Verhältnisse, um eine zwischen höhererund Gemeindeschule stehende Mittelschule handelt. Das gesamte bearbeitete Schülermaterial wird durch insgesamt rund 4.500 Schülerinnen im Alter von 6–16, bezw. 18 Jahren dargestellt. Unter diesen wurden 2,622 mit positivem Resultat untersucht: ca. 1.400 davon stellen sogenannte Ueberwachungsschülerinnen dar. Letztgenannte Zahl gibt nicht vollständig die Menge aller erkrankten oder untersuchungsbedürftigen Kinder an, da ein wenn auch geringer Teil der Eltern schulärztliche Untersuchung verweigerte. Die für das Gymnasium Angemeldeten, meist im Alter von 12-14 Jahren, müssen sich allerdings sämtlich einer Untersuchung unterziehen, sodass hier ein kleines, aber übersichtliches Material zusammenkommt. Da stets mehr Anmeldungen vorliegen, als Plätze im Gymnasium vorhanden sind, kann bei den Aufzunehmenden auf den Gesundheitszustand, der durch die Noten I, II, III, gut, mittel, leidlich ausgedrückt wird, insofern Rücksicht genommen werden, als beim Zusammenfallen nur mässiger intellektueller Kräfte mit schwacher körperlicher Entwicklung Aufnahme verweigert wird. Das ist von schwerwiegender Bedeutung für die gesamte Klasse geistig arbeitender Frauen, der auf diese Weise zu früher Invalidität bestimmte Individuen ferngehalten werden, Individuen, denen ein akademischer Beruf vielleicht einen Zusammenbruch bringen würde, während sie bei einem andern gesund und langlebig bleiben. Gerade die Neuheit der akademischen Frauenberufe zieht eine Menge auch ungeeigneter Elemente an, und Beispiele haben gezeigt, welch' traurigem Schicksal die auf der Bahn Liegengebliebenen entgegengehen. Die Untersuchungsergebnisse an diesen 327 Mädchen ergaben folgendes:

Mit Gesundheitsnote I wurden 63=19 Prozent, mit II 202=62 Prozent, mit III 61=18.5 Prozent bedacht. Eine Schülerin wurde des ausnehmend schlechten Allgemeinzustandes wegen (Herzfehler, hochgradige Kurzsichtigkeit, Wirbelsäulenverkrümmung, Unterernährung) ohne weiteres zurückgewiesen. Mit 18.5 Prozent der III. Kategorie haben wir fast $\frac{1}{3}$ nur bedingt tauglicher Elemente. Bei diesen heranwachsenden jungen Mädchen und dem Zwang der Untersuchung an Kindern, die zum grossen Teil keiner ärztlichen Hilfe bedürfen, war der weibliche Arzt natürlich eine strikte Bedingung.

Der Zustand der übrigen 2.295 Untersuchten machte in 1,396 Fällen Mitteilungen an die Eltern, die als Aufforderung, ihre Kinder ärztlich behandeln zu lassen, gilt, nötig. Diesen Aufforderungen wurde in 85–90 Prozent entsprochen. Zu betonen ist, dass nur diejenigen Eltern schulärztliche Mitteilungen erhielten, deren Kinder weder dauernd unter hausärztlicher Beobachtung standen, noch an den konstatierten Uebeln jemals behandelt worden waren. In den noch übrig bleibenden rund 900 Fällen genügte hygienische Belehrung der Mädchen, Dispense oder Teildispense, Schulanordnungen, etc.

Immerhin sprechen die eben arwähnten Zahlen, aus denen hervor geht, dass ein Drittel sämtlicher Schülerinnen an unbehandelten Uebeln litten, die eine Schuluntersuchung erst aufdeckte, deutlich genug für die Notwendigkeit des Schularztes an den höheren Schulen, besonders aber auch dafür, dass seine Funktionen noch mehr auszudehnen sind.

Welche Erkrankungen vorwiegend in Frage kommen, zeigt die Tabelle A, deren erste Kolonne die prozentuale Beteiligung des Gesamtmateriales an den verschiedenen Erkrankungen darstellt. Diese Zahlen können als zu niedrig gelten, da sich namentlich in den ersten Jahren eine Reihe von Kindern der Untersuchung entzogen. Kolonne II behandelt sämtliche untersuchten Töchterschülerinnen und III die Gymnasialaspirantinnen, IV and V zeigen die Untersuchungsergebnisse des letzten Schuljahres, gesondert nach den Lernanfängern und Schülerinnen aller übrigen Klassen. Wir sehen, dass die Blutarmut in der Form der Oligaemie bei jüngeren Kindern, der Chlorose des Entwickelungsalters bei älteren die höchsten und für alle Gruppen ungefähr gleichen Werte erreicht, nur übertroffen durch die skrofulösen Erscheinungen bei den Lernanfängern, an denen fast die Hälfte der Neueingeschulten besonders in der Form allgemeiner Drüsenschwellungen etc., leidet. Ob gerade diese Zahlen einem geografischen Verbreitungsgebiet entsprechen, an anderen Orten andere sind, müsste erst die vergleichende Schulhygiene lehren. Wenn die Skoliosen im Jahre 1911–12 scheinbar plötzlich von ca. 7 Prozent auf 15.38 Prozent heraufschnellen, so hat dies seinen Grund darin, dass die Stadt auch für die höheren Schulen Einrichtung orthopädischer Turnkurse in Aussicht genommen hat und sich dafür eine Menge Schülerinnen vormeldeten und auch die unbedeutendsten Fälle vorgemerkt wurden. Schwachsinn und Schulunreife kommen naturgemäss nur für die Lehranfängerklassen in Betracht.

Infolge seiner Vertrautheit mit den Schulverhältnissen erkennt der Schularzt den Urgrund manchen Leidens gerade in diesen. Er sieht die Kinder unter ganz bestimmten psychischen und physischen Verhältnissen, die den Eltern und dem Hausarzt fremdbleiben und kann diese in den Kreis seiner hygienischen Betrachtungen ziehen. Er kann, um ein Beispiel anzuführen, beobachten, wie manche Kinder

Sommer und Winter gewohnheitsmässig grosse Mengen Wassers trinken und sich dabei Verdauungsstörungen zuziehen. Er sieht, wie sie mit demselben Erfolg ihr Frühstück hastig und ungekaut verschlingen, schon halb mit Rennspielen beschäftigt oder diesen zustrebend, oder wie sie der äusseren Verwendung des Wassers viel weniger Liebe entgegen bringen, mit schmutzigen Händen essen, etc. Er beobachtet, wie die Lernanfänger auf den ungewohnten Zwang des Schullebens reagieren, welche Schwierigkeiten das Stillsitzen nervösen Kindern bereitet, wie erregend die gehäuften neuen Eindrücke wirken und wie manche geistig geweckten und lebhaften Kinder still und ernst werden unter der Anspannung dem Lehrstoff zu folgen. Das schulärztliche Auge bemerkt weiter, wie die verbrauchte Klassenluft auf den Organismus besonders der grösseren Mädchen einwirkt. Das puberale Weib scheint infolge weitgehender Anaemien gerade gegen mangelhafte Lüftung ganz besonders empfindlich zu sein und mit Kopfschmerzen und Ohnmachten darauf zu antworten, vielleicht um so leichter, je grösser die Schwankungen in der Ventilation sind; denn diese richten sich häufig nach dem Grade des Lufthungers der Lehrkraft. Empfindliche weibliche Lehrkräfte predigen das Abhärtungsregime und lassen soviel Fenster offen als möglich, während gleich darnach ein männlicher Lehrer sich gegen jede Art von Lüftung wehrt.

Das Hauptgewicht der schulärztlichen Tätigkeit an den höheren Schulen liegt in der Beobachtung der soeben eingeschulten Lernanfänger und ihrer geistigen und körperlichen Eignung für die Schule, den vorhandenen psycho- und neuropathischen Besonderheiten und ihrer eventuellen Aussonderung für Wiederausschulung.

Das schulunreife, vielleicht leicht schwachsinnige, auch körperlich noch nicht fertige Kind vor den Gefahren zu früher Ueberspannung der schwachen Kräfte zu bewahren, das ist ein nur dem Schularzt zufallendes Gebiet. Die verschiedenen Kulturstaaten verlangen in einem bestimmten Alter Einschulung. Die Eltern haben kein Interesse daran, das Kind, falls es nicht körperlich ganz besonders elend ist, länger zu Hause zu behalten. Sie sowohl als die Hausärzte sind selten in der Lage zu entscheiden, ob es die für die Schule nötige geistige Reife besitzt. Nun werden diese Kinder viel zu früh auf dem Prokustesbett der Bildung hin- und hergezerrt. Sie gelangen in einen Zustand der körperlichen Schlappheit, der nervösen Uebererreizung und Uebermüdung, der sie ganz unfähig macht, den Schulforderungen zu genügen. Der erste sichtbare Nachteil besteht darin, dass sie nicht imstande sind, den Anforderungen der untersten Klassen zu entsprechen und diese repetieren müssen, der zweite weit schwerere, aber später in die Erscheinung tretende ist der, dass das unfertige Gehirn- und Nervensystem der aufbauenden Kräfte ermangelt und zeitlebens unrüstig bleibt, dass der Gesammtorganismus, zu

früh in seinen Leistungen überfordert, eine dauernde Schädigung davonträgt. Vielleicht wird der zartere weibliche Organismus mehr davon betroffen als der männliche. Die leichte Erschöpfbarkeit vieler berufstätiger Frauen scheint auf den Mangel eines gesunden Aufbaus des Gesamtorganismus zu deuten. Diese geistig überforderten Sechsjährigen werden blutarme, nervöse Sechszehnjährige und später jene schlaffen Berufsfrauen, deren Organismus auch die geringste Ueberanstrengung pathologisch beantwortet.

Zum Beweise dafür, dass ohne schulärztlich psychiatrische Begutachtung bei jedem Einschulungstermin eine Reihe Kinder sehr zu ihrem Schaden der höheren Schule zugeführt werden, führe ich einige Zahlen, die ich an anderer Stelle publiziert habe, an. Unter 900 Lernanfängerinnen aus 6 Einschulungsterminen waren 13 Prozent der Gesamtheit psychiatrisch und neurologisch genauer zu untersuchen, 5 Prozent verblieben als für weitere Beobachtung Vorgemerkte bedingungsweise den Schulen, bei 8 Prozent musste im Interesse der Betreffenden Wiederausschulung gefordert werden. Es handelt sich um 52 (5.8 Prozent) leicht Schwachsinnige, die mit 6 Jahren naturgemäss den Schulforderungen noch nicht genügen können und um 20 (2.2 Prozent) schulunreife Kinder, die infolge von Krankheit oder von langsamer familialer Entwicklung oder infolge von allgemeiner Körperschwäche und Nervosität im Gesamtkörperzustande zurückgeblieben sind. Ein Jahr länger in unumstürmten Verhältnissen hat die Entwicklung der Schulunreifen gefördert, bei den leicht Schwachsinnigen verhindert, dass eine zu frühe Inanspruchnahme der Intelligenzfragmente den Intelligenzstand verminderte. Später müssen die Debilen ja häufig doch noch nach Schulen mit niedriger gesteckten Zielen abgegeben werden. Jedenfalls stellt die schulärztliche Tätigkeit an höheren Schulen ein gut Teil psychiatrische Forderungen besonders in Richtung der Schwachsinnigenfürsorge, die von den Eltern ganz sicher nicht geleistet wird. Deren Ehrgeiz will zunächst durchaus nicht zugeben, dass die geistige Entwicklung ihres Kindes hinter der der anderen zurück ist. Auch machen sie gern das gefährliche Experiment, die Kinder durch Nachhilfestunden fördern zu wollen, wodurch sie noch mehr überanstrengt und ausserdem in ihrer Mussezeit verkürzt werden. Aus dem Anfang meiner schulärztlichen Tätigkeit, wo die Eltern häufig nicht zu bewegen waren, ihre Kinder auf meinen Rat auszuschulen, stammt mir die Erfahrung, dass die von nicht Schulreifen in der Schule zugebrachte Zeit absolut nutzlos ist. Von 20 Schülerinnen, die gegen meinen Rat der Schule verblieben, wurde keine regulär versetzt, sodass das erste halbe oder ganze Schuljahr einen absoluten Zeit- und Kraftverlust bedeutet. Neben den vorerwähnten psychisch Unreifen und Defekten finden sich noch eine ziemlich hohe Prozentzahl der Lernanfänger mit Nervosität behaftet, deren Aeusserungen zum grössten Teil auf motorischem, vasomotori-

schem und auch sekretorischem Gebiete liegen: allgemeine Unruhe, Zittern, Ticbewegungen, Mitbewegungen, gesteigerte Reflexe, asymetrisches Erröten, halbseitiges Schwitzen, dazu solche psychischer Natur: krankhafte Schulangst mit morgendlicher Uebelkeit oder mindestens der Unfähigkeit etwas zu geniessen, Schlaflosigkeit, nächtliches Aufschrecken, Zerstreutheit, Mangel an Konzentration u. a. m. Diese Symptome, andeutungsweise schon vorher vorhanden, verschlimmern sich beim nervösen Kind ganz bedeutend unter dem ungeheuern Eindruck der Einschulung mit seinen zahllosen neuen Reizen, können aber auch beim normalen Kinde Erscheinungen machen. Die Prozentzahl der Nervösen ebbt mit Gewöhnung an die Schule langsam zurück, um später besonders gegen die Entwickelungsjahre hin in anderen Formen aufzutreten.

Der Aerztin steht ganz besonders zu, den Unzuträglichkeiten durch Belehrung und hygienische Winke zu begegnen, welche vorwiegend die Schülerinnen im Entwickelungsalter bedrohen. Der grösste Teil der jugendlichen Grossstadtgeschöpfe leidet an Verdauungsträgheit und dysmennorrhoischen Beschwerden, welche bei vielen jungen Mädchen noch durch das lange und oft unbequeme Sitzen auf häufig nicht passenden Bänken verschlimmert werden. Wenn als letzter Grund dafür auch die Anämie oder vielmehr die Chlorose der Entwickelungsjahre anzunehmen ist, so werden die Beschwerden durch unzweckmässiges Verhalten in der Schule nur verschlimmert. Hier sind schulärztliche hygienische Ratschläge und Aufklärungen über Verdauungs- und Menstruationsvorgänge durchaus am Platze. Ueber beide Funktionen herrschen siegreich teils prüde, teils geradezu abergläubische, teils laienhaft unvernünftige traditionelle Ansichten, empfehlen Schonung, wo sie nicht geboten und Vernachlässigung, wo sie gefährlich ist. Indem die Entwickelung beim Mädchen viel energischer einsetzt und das Gefolge ihrer körperlichen und nervösen Beschwerden ein weit zahlreicheres ist als bei Knaben, so dass für sie die Pubertätsjahre eine schwere Klippe bilden, erwächst für die Schulärztin hier ein Gebiet ganz besonderer Aufmerksamkeit. Es ist bekannt, dass Berufsfrauen, Lehrerinnen, Telephonistinnen, kaufmännische Angestellte, Krankenschwestern u. s. w. viel mehr Urlaubs- und Krankentage benötigen als Männer in entsprechenden Stellungen. Dies wird in vielen Fällen darauf zurückzuführen sein, dass infolge unzweckmässigen Verhaltens in den Entwickelungsjahren physiologische Erscheinungen in pathologische verkehrt sind. Der Schulärztin steht es zu, darüber Erfahrungen zu sammeln, deren Ergebnisse um so wichtiger sind, je mehr das Weib als intellektuelle Arbeiterin einen wichtigen Faktor des Wirtschaftslebens darzustellen genötigt ist. Gelingt es ihr auch zahlenmässig nachzuweisen, dass die den Männern weit voranschreitende Invalidität der intellektuellen Berufsfrau auf unzweckmässiges Verhalten in der Entwicklungs-

periode zurückzuführen ist, so wäre der zu beschreitende Weg schon gegeben. Mit dem Einsetzen der physiologischen Reifezeichen lasse man für das betreffende Kind ½–1 Jahr lang weitgehende Schonung in der Schule eintreten, nehme es am besten eine Zeitlang heraus, selbst auf die Gefahr hin, dass es eine Klasse repetieren muss. Es ist immer wieder zu betonen, dass ein Teil der Schülerinnen höherer Lehranstalten intellektuelle Berufe ergreift und dann besonderen Berufsanstrengungen ausgesetzt ist oder gar eine gewinnbringende geistige Tätigkeit mit Gattinnen- und Mutterberuf vereinigt, wozu vor allem eine feste Gesundheit erforderlich ist.

Eine weitere Pflicht der Schulärztin ist es, sich in die Psyche der Einzelnen und der Klasse einzufühlen, den Einfluss ev. nervöser Lehrkräfte zu beobachten. Auch hier ist das Entwicklungsalter mit seiner Suggestibilität, seiner Bereitschaft psychischen und nervösen Reizungen nachzugeben, vielfach bedroht. Ist es in den Knabenschulen besonders die Sorge um das wirtschaftliche Fortkommen, welche Examensfurcht und ehrgeizige Regungen bis zum Selbstmordversuch hinaufsteigern, so finden wir bei den jungen Mädchen häufig eine der Entwicklung des Weibtums conform gehende erotisch getönte Neigung zu Lehrern oder Lehrerinnen, welche bewirkt, dass der ruhebedürftige Organismus zu besonderen Leistungen aufgejagt wird, worauf dieser mit Depressionen, allgemeiner Schlaffheit, Ueberempfindlichkeit, Ungleichmässigkeit in Wesen und Leistungen und anderen neurasthenischen Symptomen antwortet. Die Schulärztin hat dementsprechend auch Aufklärungsarbeit am Lehrkörper beziehentlich der nervösen und psychischen Symptome und Gefahren des Entwicklungsalters zu leisten.

Die hervorragenden Störungen und Erkrankungen der weiblichen Pubertät, die in den Kolonnen I und IV nicht gesondert aufgeführt sind, kommen deutlich bei den Gymnasiastinnen zum Ausdruck. Quantitativ hat die Blutarmut nur in geringem Masse zugenommen, ganz bedeutend aber qualitativ, da wir allein bei reichlich 14 Prozent der für das Gymnasium Untersuchten irreguläre und beschleunigte Herztätigkeit finden. Als beschleunigt wurden Pulse von 100 aufwärts bezeichnet. Die Nervosität, deren eigentümliche Note bei den Lernanfängern geschildert war, findet im Pubertätsalter ihren Ausdruck zunächst auch in der unruhigen Herztätigkeit, dann in besonderer Empfindlichkeit gegen die Schulluft—rasche Ermüdbarkeit, Kopfschmerz, Erbrechen—in hystero- hypochondrischen Vorstellungen, in psychischer Reizbarkeit, neurasthenischer Verträumtheit und Zerstreutheit und einer Reihe von Symptomen psychopatischer Konstitution.

Da die Tabelle mit ihren Zahlen für sich selbst spricht, habe ich nicht die Absicht, die einzelnen Kolonnen näher zu beleuchten. Sie zeigen eines deutlich, dass die schulärztliche Tätigkeit auch an

höheren Schulen keine Sinecure ist und dass sie sich in ausreichender Weise mit der Schulhygiene zu befassen, dass sie in hervorragender Weise psychiatrisch und neurologisch zu arbeiten hat.

Bei epidemiologischen Fragen hat der Schularzt dem jeweilig modernen Standpunkt der Hygiene der Infektionskrankheiten Rechnung zu tragen. In Staaten, wo z. B. das Aussondern und der Schule Fernhalten der gesunden Bazillen- und Keimträger und deren Geschwister gesetzlich geregelt ist, liegen die Sachen einfach. Wo das nicht der Fall ist, soll der Schularzt nach eigener Machtvollkommenheit vorgehen und vor allem Beweise sammeln, wie notwendig eine gesetzliche Regelung ist; denn während die ärmere Bevölkerung sich sträubt, gesunde Bazillenträger und deren Geschwister von der Schule fernzuhalten, weil sie die Schule als eine Art Krippe betrachten, widersetzen sich die gebildeten Klassen aus Ehrgeiz solchen Massnahmen, indem sie fürchten, die Kinder verlieren zuviel von dem Wissensstoff. Solange diese Fragen nicht allgemein geregelt sind, ist die Gelegenheit alle Vorsichtsmassregeln zu durchbrechen, leider sehr gross. Als Kuriosum erwähne ich, dass ich gezwungen war, 5 Schwestern, darunter, eine, die Diphtherie überstanden hatte und 3 hartnäckige Bazillenträgerinnen von der Schule im Einverständnis mit der Behörde fernzuhalten. Da verzog die Familie einfach nach einem Vorort, dessen höhere Schulen ärztlich nicht versorgt waren. Die Kinder durften die Schule dort besuchen, und es bot sich damit fünffache Gelegenheit, die Epidemie einzuschleppen. Wenn der Schularzt an den Gemeindeschulen berufen ist, ein breites Material und Unterlagen für sozialhygienisches Vorgehen zu sammeln, so scheint mir die höchste und feinste Aufgabe des schulärztlichen Dienstes an den höheren Schulen im Studium einer vergleichenden Sozialpathologie- oder nosologie zu liegen. Wenn wir zahlenmässig nachweisen können, welche Krankheiten und Schädigungen die Kinder einer bestimmten sozialen und wirtschaftlichen Gruppe betreffen, so ist damit auch schon der Weg zur Sanierung gegeben. Aus einem solchen Studium ergeben sich Vorteile für alle Gruppen. Beweisen wir, dass ein bestimmtes Leiden unter den Verhältnissen, die die höheren Schulen und das wirtschaftliche Niveau der einen Gruppe bieten, nachlässt, so werden wir uns bemühen, die andere Gruppe unter dieselben Lebens- und Studienbedingungen zu bringen, und umgekehrt bei einer Zunahme des Leidens. Den ersten Versuch einer vergleichenden Sozialnosologie auf Grund eines enormen Materiales machte Hermann Kohn mit seinen Forschungen an 50,000 Schulkindern, mit denen er bewies, dass das Schulleben des Gebildeten auf Sehkraft und Sehschärfe ganz besonders verderblich einwirke; 7.5 Prozent der Gymnasiasten waren Brillenträger gegen 0.9 Prozent der Gemeindeschüler, wobei in beiden Fällen eine bedeutende Zunahme der Brillenträger nach den höheren Klassen zu

konstatieren war. Ganz einwandsfreie Daten in dieser Richtung an höheren Mädchenschulen zu gewinnen ist ziemlich schwierig, da Eitelkeit der Eltern und der Schülerinnen bei den erwachseneren Kindern häufig das Brillentragen verhindert. So stellt sich die Zahl der Kurzsichtigen faktisch in höheren Klassen noch höher als die Tabelle B angibt, nicht aber die Zahl der Brillenträgerinnen. Ich mache auf den Rückgang vom 12. bis 13. auf das 13. bis 14. Lebensjahr aufmerksam d. i. von 13 Prozent Brillenträgerinnen auf 8 Prozent, ein Befund, der insofern nicht als zufälliger zu deuten war, als er an allen vier Schulen ungefähr gleichmässig beobachtet werden konnte. Hermann Kohn selbst hatte schon erkannt, dass die Zahl der Brillenträger keine absolut sicheren Schlusse ergeben konnte und deswegen später exaktere Untersuchungen angestellt. Als ganz bestimmt muss man annehmen, dass unter seinem Material damals viele Volksschüler brillenbedürftig waren, ohne dass dies erkannt wurde. Wenn sich z. B. in 4 Charlottenburger Gemeindeschulen 4.32 Prozent Brillenträgerinnen finden, d. h. in einwandsfreien, hellen, mit den besten Lehrmitteln ausgestatteten Schulen ca. 5 mal mehr als Kohn mit seinen 0.9 Prozent der Breslauer Gemeindeschüler angibt, so ist dies wohl in erster Linie auf die Tätigkeit der Schulärzte zurückzuführen, welche die Sehinvaliden aussondern, während früher die Kinder der unteren Stände rein zufällig und jedenfalls nur in den schlimmeren Fällen zu einer Brille kamen. Das hier zusammengestellte Material von schulärztlich beobachteten Schulen ergibt immerhin für die höheren Mädchenschulen fast die doppelte Anzahl der Brillenträger gegenüber den Gemeindemädchenschulen, nämlich 7.78 Prozent zu 4.32 Prozent. Jeder Rekord wird allerdings durch die von mir untersuchten Gymnasiastinnen geschlagen. Eine im August 1912 gemachte Aufnahme ergab unter den 168 Schülerinnen des Mädchengymnasiums 42 Brillenträgerinnen, d. i. 25 Prozent. Wenn diese Zahl nun in ihrer exorbitanten Höhe wohl als eine zufällige gedeutet werden muss, so ergab die achtjährige Untersuchung immerhin, dass mehr als 16 Prozent der Mädchen bereits kurzsichtig ins Gymnasium eingetreten waren. Um eine Vergleichszahl zu gewinnen, wandte ich mich an ein nur einige Strassen weiter gelegenes Mädchengymnasium einer der anderen Berliner Vorortstädte und erfuhr, dass dort von 150 Schülerinnen 18 Brillen tragen, d. i. 12 Prozent, immerhin 4 Prozent mehr als der Durchschnitt der höheren Töchterschülerinnen. Man muss nebel den Schulschädigungen unbedingt auch das Moment einer ungünstigen hereditären Auslese ins Auge fassen. Die Mädchen entstammen vielfach schon seit Generationen intellektuell arbeitenden städtischen Familien. Landkinder sind überhaupt kaum darunter. Auffallend ist der quantitativ so grosse Unterschied zwischen der Anzahl der gleichaltrigen Brillenträger der höheren Töchterschule und des Gymnasiums, wie

ihn Tabelle B zeigt, der besonders vom 13. bis zum 16. Jahre auffällt, und der wohl darauf zu beziehen ist, dass bei gleichem leichteren Grade von Myopie die Gymnasiastin viel eher zum Tragen einer Brille gezwungen ist. Im letzten Ende heisst das ja nur, dass hier die das Sehorgan schädigenden Momente ganz besonders weitgehende sind, die längere und angestreigtere Haus- und Naharbeit, die Notwendigkeit, Logarithmen zu lesen, geometrische Figuren zu studieren, die Formeln der Atomzahlen zu erkennen, was alles ein scharfes Sehen erfordert, und das alles in der ohnehin zu Schädigungen neigenden Entwickelungszeit. Gerade sie ist vielleicht schuld daran, wenn die weiblichen Gymnasiasten mindestens die fast doppelte Zahl der Brillenträger zeigt als die von Kohn mit 7.5 Prozent bei den männlichen gefundene.

Wenn diese Forschung erwiesen hat, dass die gesteigerten Schulforderungen der höheren Schulen für Mädchen eine ganz aussergewöhnliche Steigerung der Myopie zur Folge hat, so ergab eine andere Untersuchung auf dem kleinen Gebiet, um das es sich hier handelt, Zahlen, die darauf hinweisen, wie spezielle andere Erkrankungen die Mädchen der unteren Stände bevorzugen. Bei einer statistischen Untersuchung des Gesamtmateriales der Nervenpoliklinik der Kgl. Charité, das mir durch die Freundlichkeit des Herrn Geheimrat Bonhöffer zugänglich war, stellte sich heraus, dass unter den in den Jahren 1910 und 1911 zur Behandlung gekommenen 705 reinen Fällen nervöser Erkrankungen, nachdem Schwachsinn und psychopathische Konstitutionen ausschieden, allein 160 Choreafälle waren. Es litten daran von dem Gesamtnervenmaterial unter 368 Knaben 58, d. i. 12.5 Prozent, unter 336 Mädchen 106, d. i. 31.5 Prozent. Diese namentlich in Bezug auf die zu poliklinischer Behandlung kommenden Volksschülerinnen ausserordentlich hohen Zahlen veranlassten mich zu einer vergleichenden Forschung an den 2,620 Schülerinnen der vier hier öfter erwähnten höheren Mädchenschulen und an 3,100 Schülerinnen von vier Charlottenburger Gemeindeschulen, welche ergab, dass von den ersteren im Alter von 6 bis 14 Jahren 13, d. i. 0.49 Prozen, von den letzteren 22, d. i. 0.70 Prozent, Veitstanz überstanden hatten, bezw. noch daran litten. Die Untersuchungen an den Gemeindeschulen hatten in liebenswürdigster Weise die Herren Schulärzte daselbst übernommen. Die Zahlen aus den höheren Schulen dürften ziemlich exakte sein, die der Gemeindeschulen sind eher noch etwas höher zu stellen, da Abortivfälle hier kaum zur Beobachtung kommen. Wenn wir sehen, dass diese hervorragende Erkrankung der weiblichen Kinder sich bei den Gemeindeschülerinnen im Vergleich zu den höheren Töchterschülerinnen im Verhältnis von 3 : 2 zeigt, so müssen wir doch an besondere Milieuschädigungen denken, welche eventuell bei genauerer Erkennung zu verhüten wären: schlecht abgewartete Erkältungskrankheiten u. a. m.

Myopie und Chorea wurden nur herausgefasst, um einige vergleichende Zahlen zur Sozialpathologie zu liefern, wie sie dem Schularzt in die Hände fallen und natürlich weiter auszugestalten wären.

Um ein gutes Vergleichsmaterial zu gewinnen, würde es sich vielleicht empfehlen, demselben Schularzt höhere und Volksschulen zuzuweisen.

Allgemein dürfen wir für die höheren Schulen folgendes nicht vergessen:

1. Die Schädigungen, welche wirtschaftliche Not den Volksschülern bereitet, werden bei den höheren Schülern aufgewogen durch die Ueberbürdung, Mehrforderung an die Intelligenz, eine höhere Stundenzahl.

2. Das Schülermaterial der höheren Schulen rekrutiert sich nur zum Teil aus wirtschalftlich gut gestellten Kreisen, zum andern Teil aus unter anderen Lebensformen in gewissem Sinne Notleidenden, zu denen, was die Mädchenschulen betrifft, beconders diejenigen gehören, an welche durch die Notwendigkeit einer Berufswahl höhere Anforderungen gestellt werden.

3. Allgemeinuntersuchung aller für Gymnasien bezw. das Studium vorgemerkten Mädchen ist in Anbetracht der höheren Anforderungen an Körper und Centralnervensystem im akademischen Frauenberuf eine dringende Forderung, um schwächliche Elemente auszusondern, um insonderheit zu verhüten, dass der weibliche Gesamtorganismus unter Ueberanstrengung leide und die intellektuellen Fähigkeiten auf Kosten der mütterlichen Anlagen ausgebildet wurden. Hier ist wie überhaupt für das puberale Alter der weibliche Arzt zu wünschen.

4. Eine Reihe von Leiden und Schädigungen der Schüler können weder von den Eltern noch vom Hausarzt erkannt und bekämpft werden, da sie einmal hauptsächlich in der Schule zum Ausdruck kommen, aus Schulschädigungen hervorgehen oder durch solche vertieft werden. Sache des Schularztes ist es, solche Leiden zu erkennen und für Abschaffung der schädigenden Momente Sorge zu tragen.

5. Allgemeine Untersuchung der Lernanfänger in Hinsicht auf ihren körperlichen, nervösen und Intelligenzzustand ist für höhere Schulen eine dringende Forderung, damit körperlich und geistig schulunreife und schwachsinnige Kinder im eigenen Interesse und in dem der Schule ausgesondert und zwecks weiterer Reifung zurückgestellt werden können.

6. Dem weiblichen Schularzt fallen ganz besondere Untersuchungen über Schulschädigungen des Entwickelungsalters und hygienische Belehrung der jungen Mädchen zu.

7. Der Hauptwert der schulärztlichen Forschungen an höheren Schulen liegt auf dem Gebiet der vergleichenden Sozialnosologie. Je mehr wir die Verteilung der Jugendkrankheiten und -leiden nach den verschiedenen sozialen und damit einhergehenden Schulmilieus

kennen lernen, um so besser werden wir imstande sein, sie zu bekämpfen.

Der schulärztlichen Beobachtung unterstanden in den Jahren 1904–1912 insgesamt 4,120 Schülerinnen, darunter 327 Gymnasialaspirantinnen. Zur Untersuchung kamen 2,295 Töchterschülerinnen und sämtliche 327 Gymnasialaspirantinnen. Nach Prozenten berechnet vertritten sich die Erkrankungen folgendermassen.

TABELLE A.

Es litten an:	I. Sämtlicher 4,120 Schülerinnen.	II. Aller zur Untersuchung gekommener 2,295 Töchterschülerinnen ohne die Gymnasialaspirantinnen.	III. Der 327 Gymnasial, aspirantinnen.	Ueberwachungsschülerinnen des Jahrganges 1911–12. IV. Der 295 Lernanfänger von 1911–12.	Ueberwachungsschülerinnen des Jahrganges 1911–12. V. Der 416 im Jahre 1911–12 untersuchten älteren Töchterschülerinnen.
	Prozent.	*Prozent.*	*Prozent.*	*Prozent.*	*Prozent.*
Blutarmut	15.77	25.00	25.07	24.50	25.00
Irregulären und beschleunigte Herzthätigkeit	3.03	5.00	14.37	2.71	5.00
Herzfehler	.06	.95	1.52	.....	.....
Nervösen Erscheinungen	7.88	12.50	7.03	16.70	14.42
Skrofulose aller Grade	13.35	20.00	15.95	35.00	16.58
Wucherungen im Nasenrachenraum	5.53	8.50	1.52	9.15	6.00
Kurzsichtigkeit	8.73	14.00	16.20	.....	15.86
Sehschwäche	.36	.57	3.00	.33	2.40
Schielen	2.04	3.20	.61	3.39	2.16
Bindehautkatarrh	.97	1.78	.....	.....	.....
Hörschwäche höheren Grades und beider Ohren	1.94	3.40	2.75	2.03	5.25
Stottern	.80	1.25	.....	.33	1.68
Schlechtem Ernährungszustand	.92	1.44	2.44	2.03	1.92
Chronischen Erkrankungen der Luftwege	2.01	3.15	3.02	3.72	2.88
Wirbelsäulen-Verkrümmung	4.83	7.00	3.42	3.39	15.38
Schwachsinn bezw. Schulunreife	1.70	2.66	.....	6.75	.....

TABELLE B.—*Brillenträger.—Anzahl der in Schuljahr 1912 ermittelten Brillenträger unter den Schülerinnen.*

	Vier von Gemeinde (Volks) Schulen.			Vier höherer Mädchenschulen.			Eines Mädchengymnasiums der Stadt Charlottenburg.		
	Anzahl der Schülerinnen.	Anzahl der Brillenträgerinnen.	Prozentzahl der Brillenträgerinnen.	Anzahl der Schülerinnen.	Anzahl der Brillenträgerinnen.	Prozentzahl der Brillenträgerinnen.	Anzahl der Schülerinnen.	Anzahl der Brillenträgerinnen.	Prozentzahl der Brillenträgerinnen.
Im Alter von Jahren:									
6–7	380	2	0.52	296	7	2.39	.....	.....	.....
7–8	398	12	3.01	304	15	4.93	.....	.....	.....
8–9	464	9	1.94	321	16	4.98	.....	.....	.....
9–10	480	22	4.58	328	24	7.31	.....	.....	.....
10–11	531	39	7.34	306	26	8.49	.....	.....	.....
11–12	392	24	6.12	324	32	9.87	.....	.....	.....
12–13	455	26	5.71	279	38	13.62	33	3	9.0
13–14				203	17	8.37	29	8	27.6
14–15	.....	.....	.....	151	15	9.93	26	4	15.3
15–16	.....	.....	.....	108	14	12.96	23	8	34.7
16–17	.....	.....	.....	.....	.....	.....	31	10	32.2
17–18	.....	.....	.....	.....	.....	.....	26	9	34.6
Gesamtzahl	3,100	134	4.32	2,620	204	7.78	168	42	25.0

TABELLE C.—*Chorea minor.*

	Gemeindeschülerinnen.			Höhere Mädchenschülerinnen.		
	Anzahl der Schülerinnen.	Anzahl der Chareatischen.	Prozentzahl der Chareatischen.	Anzahl der Schülerinnen.	Anzahl der Chareatischen.	Prozentzahl der Choreatischen.
In Alter von 6–14 Jahren.....	3,100	22	0.70	2,620	13	0.49

Anstatt Brillenträgerinnen in Toib. D. jesmot Chareatischen.

[1] Der in No. 5, 1912, des "Schularzt" erschienene schulärztliche Gesamtbericht für Leipzig 1910–11 gibt eine Uebersicht über 48 Schulen, darunter 5 höhere Bürgerschulen.

[2] Dr. Therese Oppler und Dr. Clara Bender haben ihre Erfahrungen über je ein Sondergebiet publiziert. Die Erstgenannte hatte unter 783 höheren Töchterschülerinnen 252, also beinahe ein Drittel Ueberwachungsschülerinnen.

THE PUBLIC SCHOOL AS A POSSIBLE FACTOR IN PREVENTING INFANT AND CHILD MORTALITY.

HENRY L. COIT, M. D., Newark, N. J.

There are a great many causes of infant mortality, many more than in any later period of life, more than in all other periods after infancy combined.

Some of these are contributing causes; they are obscure and indirect, like parental indifference, which is conducive to neglect; like adverse social and industrial influences upon the prenatal and nursing periods, and like ignorance, which surrounds not only the newly born but the older infant with many conditions inimical to its life.

Some of these are immediate causes; they are obvious and direct, like milk which often conveys infectious disease; like malnutrition from irrational feeding, which is none the less direct, though more insidious, and like congenital physical defects, which are such potent factors in the mortality of infants in the first few weeks of life.

There are many who would claim that human mortality in infancy is not an evil, yet those who have experienced or witnessed a mother's grief when contemplating a vacant crib will not agree. We believe that it is an economic misfortune for any nation to lose its children, and that no nation can rest on a firmer foundation than the vitality and viability of its offspring.

While the mortality phase of the question can not be magnified in importance, yet there is another aspect of the question which concerns us far more, namely, the physical condition of those, who, while handicapped in infant life, still remain to struggle on up through childhood to feeble, ineffective, and dependent adult life.

While millions of infants suffer during a short and terrible life, and die before they realize what life means, many more millions are so unfortunate as to live on with a physical handicap which makes life a torture, the home a pandemonium, and family life anything but desirable.

This is not an unmixed evil, however, as the following quotation from Nevin, of Manchester, will show:

> It is not merely, then, our desire to reduce infant mortality, which causes us to study this problem, but we are moved even more by the consideration that, for every infant we can save, we shall raise the level of many others who might have pulled through, but not so successfully.

The best means of preventing sickness and death would be to raise the living power of the individual to what is called immunity. If we could apply this principle to infancy and childhood, through educational and prophylactic measures, we would bring about the greatest possible physical efficiency in manhood and womanhood.

While physicians have led in this crusade against infant mortality, it is strictly a problem in preventive medicine, and therefore clearly to be solved by educational methods, which should be applied by the people (the State), at the expense of the people, and for the people.

Beyond this, when we forecast the future of our children and regard them as prospective parents and citizens, to whom we must leave the responsibility of parenthood and citizenship, and who must take, maintain, and develop the institutions which our fathers established and which we transmit, the question assumes an important relation to the stability of the nation.

The educational board of Manchester, England, in 1902 instituted the instruction of seventh-grade schoolgirls in infant hygiene so that they could be useful as the mother's helper. They were called "little mothers." The plan has been successfully introduced in several of our own cities, with excellent results and lasting benefits to the infants at home.

Another and a more widspread movement antedated the foregoing plan by 10 years. The Consultation for Nursing Mothers (Consultation de Nourisson) is a center for the education of the mothers. It was also of European origin, in 1892. For this institution we are indebted to Budin, De Four, and Variot, in France. When properly organized it is always under medical control and direction, and its station work is followed by a visiting nurse who supplements the medical work by teaching the mother in her home.

We propose, as a comprehensive plan to check sickness and death among infants and young children, that to the Manchester plan for "little mothers" shall be added the French plan, and that the "con-

sultation for mothers" shall be conducted within the public school and finally become part of its system.

It can not be repeated too often that the most fundamental cause of infant and child mortality, expressed through many channels, is ignorance, and the most potent influence which will destroy and remove it, is imparted and applied knowledge.

Infant and child hygiene and the care and management of children should be taught in women's colleges, in finishing schools for girls, and to pupils of the eighth grade, the "little mothers," but a much wider field for this instruction would be the mothers of the industrial class in the congested school districts, many of whom did not, and most of whom could not, complete the curriculum of the school.

This instruction has, heretofore, been given by private philanthropy in hospitals and infant-welfare stations at a few isolated points, and has been made available for comparatively few of the great mass of mothers who need it most.

Since the great majority of these women do not realize their ignorance until they have children to care for, and since the mother has the custody of the child before and after the school period, and since she was not taught infant welfare in the school, she ought to receive a post-graduate course from the school, with her own baby as an object lesson.

This kind of instruction applied to the indigent mothers in a school district would be justified, for the safety of the school itself, since, from these homes, where parental ignorance prevails, there is a daily migration of older children to the school, who often become the carriers of disease.

The home and its hygiene, the mother and her maternal fitness, the children and their health, are all intimately linked with the school, and anything affecting the integrity of any of these, is a menace to the school.

Hospitals and infants' welfare stations are too few and too scattered; public schools are found in every district, are easy of access; and, aside from the importance of having the mother's interest early linked with the school where her child will later spend much of its time, the logical rallying point for imparting and receiving public instruction is the public school.

Teaching the mother or caretaker to lay firmly the physical foundation of the child, as a preparation for efficient intellectual work during school life, which continues through so long a period of childhood, is, we believe, a legitimate function of the public school.

Such knowledge, properly imparted through this channel, would become a most effective factor in the prevention of infant and child mortality, because it would be bestowed upon a far greater number than, as now, through isolated medical charities.

The knowledge necessary to the attainment of these great objects is now within our grasp, is systematized, and needs only the active agency of the public school, with the cooperation of trained physicians and nurses, to make it effective.

The plan of placing "the mothers' consultation" in the school grew out of necessity. In the summer of 1911 one of the stations of the Babies' Hospital, in Newark, N. J., located in a congested district, was no longer available, and was temporarily transferred to a vacant schoolroom nearby. The writer then saw an opportunity to illustrate a plan for putting such consultations in all the elementary schools. Application was made to the board of education for the use of the Eighteenth Avenue School, which was granted for the purpose of working out the details of the plan under the direction of the Babies' Hospital staff.

There is no work of a strictly medical character performed at these consultations or in the homes; only the instruction of the mother and the gathering of data to determine the influence of instruction upon the viability of the child. This includes records of the vital phenomena and social statistics. Instruction is given to the mother in the following: Hygiene, reasons for cleanliness, dangers of dirt, care of the new born, importance of breast feeding, the care of milk, artificial feeding, weaning, children's diet, management, advantage of system, the bath, the clothing, the rooms, the air, ventilation and sunshine, the baby's bed, its sleep, danger of anodynes, exercise, and the care of the sick child. If a child is found ill it is referred to the family physician, or, if too poor, to a medical clinic or hospital.

The link which will fix the mother's interest is the periodical weighing of the baby, which is the best index of its progress. The interest of the visiting nurse in the infant's welfare, and her attempt to help the mother apply the instructions given by the physician will engage the mother's best efforts to apply them, and one year's teaching of this character becomes a liberal education in the hygiene of the home.

The consultations, one for foreign-speaking mothers and one for English-speaking mothers, are in charge of the medical staff of the Babies' Hospital, with the active cooperation of the principal and his teachers, upon which depends largely the success of the experiment.

A detailed report of this work and its results for the first year will shortly be made to the Board of Education of the City of Newark, with the hope that it may be found valuable enough to be established elsewhere.

THE NEED OF COMMUNITY PLANNING IN CHILD-WELFARE WORK.

Mr. Wilbur C. Phillips, Milwaukee, Wis.

I must ask the forbearance of my hearers if I repeat in this paper what I may already have said before; but the need which I present seems to me to be so great, and its full appreciation so rare, that reiteration of some of the fundamental principles which underlie it may perhaps be justified.

I have purposely reduced my paper to its briefest and most concise form, and shall be thankful if it makes one point and drives it home.

Child welfare, in its narrowest sense, is work (*a*) to reduce infant mortality, and (*b*) to protect the health of the babies who have been saved.

In a broader sense, it is work to lay the foundation of health among children up to school age.

In its broadest sense, it is work for the physical, intellectual, and spiritual development of all children—those who are living as well as those who are to be—in other words, of the race.

Child welfare is the most important branch of health work.

First. Because deaths under 1 year of age exceed in number deaths among all ages from any single cause, the general death rate of any city being practically determined by the number of its infant deaths, which usually constitute from 20 to 30 per cent of its total deaths.

Second. Because a great proportion of infant deaths are almost immediately preventable.

Third. Because the child of to-day is the adult of to-morow, making child-welfare work the cheapest and most effective kind of preventive health work.

Fourth. Because child-welfare work appeals to the sympathy and understanding of the laity, winning cooperation and support where other forms of preventive work fail.

Fifth. Because, in order to preserve child life, it is necessary to deal with every condition which affects the health of the family, work for child welfare thereby constitutes the best opening wedge in laying the foundation of general preventive health work.

Child welfare is not to be solved through the application of any single remedy. The pasteurization of milk, the instruction of mothers, the boarding out of babies—valuable as they are—will not in themselves avail.

All factors must be taken into consideration.

Mothers who overwork during pregnancy are incapable of bearing strong children.

Mothers who are sick or diseased, underfed, or malnourished, are hindered from giving suckle.

Mothers who scrub floors and take in washings in order to supplement the family income can not care for their children properly.

Every case of tuberculosis which throws a wage earner out of employment and places additional responsibility upon an already tired mother contributes to infant mortality. Every boy or girl who, through lack of parental guidance or sympathetic instruction in our public schools, grows up impure in thought and action, endangers the health and life of some baby in the future.

Infant mortality is a social problem, depending for its solution upon the correction of every specific evil which to-day engages the attention of philanthropic societies and civic authorities.

The business of life—the excuse for industry and government, laws, and institutions—is the rearing of children.

It is important therefore that we should plan wisely for the child.

A community child-welfare plan is synonomous with a social program. Its chief distinction lies in its point of approach—the child, as I have said, furnishing the best and most easily understood argument for social effort.

A complete social plan should, of course, embrace the improvement of those conditions of industry, employment, sanitation, wages, housing, and so forth, which deleteriously affect the health of families and, through them, of the child. This is a matter for public control and responsibility, to be brought about by collective action on the part of people in the aggregate, and it must be achieved before the welfare of the child can be completely attained.

Of equal importance, however, is the immediate necessity of supplying to every family the knowledge, medical and nursing supervision, and material things needed to prevent ill health and conditions deleterious to home life over which the members of those families largely have control. This is a matter of organized preventive health education and relief.

No city can plan intelligently for its children unless it has the two programs just described—a broad social or ultimate program and an immediate program.

Neither of these programs can be formulated without definite knowledge of community conditions. Such knowledge can not be obtained without a comprehensive thorough-going community survey, such a survey as the one in Pittsburgh being none to good for the purpose.

Once the survey is complete, every problem capable of present attack should have a definite program outlined, and each of these programs should again present a goal at which to aim and should offer suggestions for immediate work.

Without an ultimate program, immediate efforts are too often of little permanent value.

Without an immediate program, it is idle to discuss future plans. The two are absolutely essential.

We can work wisely now only in so far as we see clearly where we are headed. On the other hand, we can never arrive at the point we wish to reach unless we work wisely now.

The criticism I would make of the average survey is its failure to provide these two programs.

Most surveys are merely records of investigations made, and fail either to provide a constructive plan or methods of organization.

This is due, first, to the lack of individuals experienced in community social problems who, by virtue of their experience and training, are able to take the data and information gained through research and investigation, and construct therefrom a social program fitted to the special needs of a given community; second, to the vastness and complexity of our social problems, which have baffled and discouraged those who have approached them constructively from the community standpoint.

If we are to solve the problem of child welfare we must first of all engage social organizers who will take up the work where the surveyor leaves off. If the surveyor and organizer can be identical, so much the better. Too often those who make our surveys and investigations leave the community just when their experience and knowledge begin to make them valuable.

Secondly, we must see and understand that the problem of supplying the knowledge, medical and nursing supervision, and material things necessary to the immediate program of child welfare at least, complex and difficult as it is, is no more complex or difficult than many of the problems of ordinary business, and like them can be overcome by the application of business principles.

Consider for a moment the various forms of social work, private and public, whose aim it is to supply one or another of these social needs.

From the standpoint of concentration toward a single result, could there be a worse example of loose, haphazard, unbusinesslike effort?

These organizations may be likened to the small business concerns which existed before our large amalgamated forms of industry sprang into being. With each of them the overhead charges are out of proportion to the amount of goods handled. As a result, the cost of the social commodity which they supply is so great that only a small part of the need can be filled.

Absolutely no need exists for separate organizations to supply, not only those special commodities which suggest themselves at first thought in connection with child welfare, namely, prenatal instruction to mothers, care and attention to prevent blindness, work to

improve the standards and practices of midwives; maternity work, postnatal instruction to mothers, material relief, etc., but also those other more general commodities supplied by organized philanthropy and by the community itself.

This is not theory.

The work of the child-welfare commission in Milwaukee, one phase of which was the maintenance of practically such a district health station, proved it beyond a doubt.

Efficiency and economy demand that our social agencies, public and private, each handling its own special social commodity, shall merge under community leadership.

This merging may not take place to-day or to-morrow, but it must and will inevitably take place.

The rapidity with which it takes place will measure the rapidity with which we achieve social progress, and thereby solve the problem of child welfare.

Only by community planning can this result be obtained. The task is too big for single agencies. The direct leadership, power, and authority of the municipality is essential where so many and complex forces are to be harmonized and brought together.

It seems like a tremendous task—this concentration of social forces toward an immediate child-welfare program. So far there can be no doubt but that it has baffled the workers.

But is it after all so difficult?

Look at our largest cities, for example, and try to imagine them, not as a hodgepodge of conflicting forces, but as a collection of small areas. Try to imagine in each of these small areas a social bureau whose aim it is to distribute to every family therein knowledge, medical and nursing supervision, and the material things necessary to the conservation of the home and the proper development of children.

Is it hard for you to imagine that such a bureau, with the authority of the municipality behind it, could do for 100 per cent of the families in its district the work just indicated?

It is not hard for me, because in our work in Milwaukee the child-welfare station either actually did all of these things or proved very clearly the possibility of doing them.

Wise community planning, based on a comprehensive survey under expert leadership and participated in by all individuals and agencies interested in public health, will overcome many difficulties which seem insurmountable to-day.

The ultimate goal is a social program.

The immediate aim should be the organization of all the present social agencies for a cooperative, and as soon as possible an amalgamated, use of the same mechanism of distribution.

Without the latter the former will never be achieved. Industry, employment, and wages can not be considered apart from the home. Economic conditions can not be changed merely by effort from above. The individuals whom it is desired to help must be taught higher standards of living, so that they will demand these improved conditions for themselves and their little ones. Community planning, in order to correct these basic social conditions, demands community education in all things which affect the health of the family and of the home, and this, as I have endeavored to show, can only be possible by concentrated effort under community leadership.

PARENTS' COOPERATION IN PROMOTION OF CHILD HYGIENE.

Mrs. Frederic Schoff, President National Congress of Mothers, Philadelphia, Pa.

Without the cooperation of parents little can be accomplished in promotion of child welfare.

Yet to-day parents are indifferent and unconscious of their great responsibility and of their own ignorance, with its fatal consequences.

There can be no real progress in promoting child hygiene until definite, successful, and comprehensive measures are set in motion to enlist those who are the actual caretakers of the children.

There are several groups of people whose support must be enlisted before real progress can be made. Physicians are already interested. Parents, boards of health, educators, and city councils still need to be aroused and stirred to a realization that infant mortality is preventable, and, that being a fact, it is criminal not to prevent it.

Those who are considering child hygiene in its broad aspects have two things to do: First, to meet as well as may be done the present conditions of ignorance and indifference prevalent in all walks of life. Second, to take measures to prevent the continuance of such conditions in the next generation.

The National Congress of Mothers, which has for its sole work the provision of conditions for the best development of every child in body, mind, and spirit, has the advantage of a constituency thoroughly alive to the need of education for parenthood. For 16 years it has striven to show the limitless possibilities of childhood when properly understood and developed.

It takes time to battle down the old wall of belief that mother instinct teaches a woman all she needs to know about child nurture. So strongly has this become an accepted part of our life that no recognition of woman's life as home maker, wife, and mother is given in

her education. To help her in her great mother work the Mothers' Congress has had to devise temporary means to reach her where she is, to awaken her responsibility to the welfare of her children, and to guide her in the study of child nurture.

There are certain principles that, from experience, have been proved necessary to success in enlisting parents in the great movement for child hygiene.

The child hygiene movement must be placed clearly on an educational basis, differentiated from charity, if it is to succeed. It must not be emphasized as for poor mothers, for that makes it difficult to reach thousands of homes which need enlightenment. The movement should be, in the beginning, a campaign of education as to the difference in death rate in districts where parents have been educated in child hygiene and in the same or similar districts before education.

Consciousness of the need must be created before instruction can be given.

Boards of health can do much to promote interest and place the movement on an educational basis. A department especially devoted to child hygiene should be created and given to a specialist in the subject. A room should be fitted up with a permanent educational exhibit, showing the proper development of children and results of improper care. Birth registration, when rigidly enforced, makes it easy to know of every new mother. A pamphlet expressing the interest of the board in the future welfare of the baby, giving some rules as to its care, inviting the mother to visit the mothers' room in board of health, and asking her cooperation in the health work for the babies of the city, if sent to every new mother, would bring home the fact that the baby's health is a matter of interest to the city, and it would give emphasis to the need of special study to keep it.

The service of a nurse specially trained in baby hygiene, who can visit and organize district groups of new mothers for child study, gives a more permanent value to the movement for child hygiene.

When a circle of mothers once realizes that child hygiene is a science, not a fad, they become ardent promoters and win other mothers.

They begin to see that child nurture in its every phase is no less a science, and so the uplift of the race will begin.

Parents and boards of health will need the support of councils to give the funds necessary to conduct child hygiene departments and make them a real educational center for every mother.

At the present time a campaign of education is needed among men to show that the support of measures to save life can not properly be ignored, and among women to prove that mother instinct is not sufficient to prevent infant mortality. Baby-saving

shows, health contests, or any movement that educates public opinion as to the need for ample support for life saving are valuable and necessary. The National Congress of Mothers, with its organization for parental education, has been and will be a vital factor in winning cooperation of mothers in the promotion of child hygiene. The thorough organization of parents is a necessary preliminary.

There can be no doubt that knowledge on this subject should be possessed in a large degree before the time comes for its use and that the need for it is universal. The schools must recognize this. Education of every child should include thorough teaching in the laws of hygiene. The great functions of fatherhood and motherhood should not be ignored in the training of children for life. They should be held up as the highest and most far-reaching functions of human life.

Children love to play with babies, and the protection of baby life would not be an abstract subject if real babies were a part of it. This knowledge is of such vital moment to everyone that no child should leave school without receiving practical instruction in infant hygiene. Grammar schools would have to include it to make it available for the masses who never go further in school life.

Child hygiene not only includes the care of the baby, the foods that nourish and build up bone and muscle, but the use and care of every function of the body.

To exclude instruction on the procreative organs is as injurious in its consequences as the ignorance of infant hygiene.

Parental ignorance must be replaced by a thorough knowledge on the part of parents as to these important functions and the necessity for teaching children to look at them from the highest point of view. Parents do not realize that they themselves are largely at fault for the low moral tone that causes the social evil. They have never been taught concerning this phase of hygiene. They can not give their children what they do not themselves realize or know, yet until parents are thoroughly aroused to their duty in this regard, little progress can be made.

The National Congress of Mothers believes that there should be no undue emphasis on this, but that the first step necessary to enlist parents in this phase of child nurture is to show them clearly the terrible results of failure to protect innocent boys and girls by clear teaching as to the sacredness of the generative functions and the consequences of their violation.

Without question this teaching is the duty of every parent, but at the present time parents are not prepared to give it, and there are few who approach it from the right attitude, which is as important as a knowledge of the facts.

To secure the cooperation of parents, to enable them to fulfill their duty in this vital matter, is the first step toward its solution. It is the opportunity of the parent teacher associations.

The Congress of Mothers, in its organization of parent teacher associations in connection with every school, supplies in its recommended courses of child study the parents' duty in this important particular.

Every parents' association is urged to study every phase of child hygiene as fundamental. The study of the mental and spiritual growth is advised and fostered by suggestions as to where and how the latest and best thought on these subjects is available.

The National Congress of Mothers is in reality an educational school for parents and others who have the training and care of children.

It plans its work to reach parents wherever they may be, and adapts its educational work to meet present needs, while, at the same time, it strives to promote opportunities for more intelligent parenthood for the coming generation.

Being international in its scope, having cooperation with Government departments and boards of health, it seems the necessary medium for the use of physicians and scientists in reaching the homes where the laws of hygiene must be so simply and clearly stated that the simplest mind may understand them.

There must be organization and machinery for promotion of any propaganda.

The National Congress of Mothers and parent teacher associations have made great strides in the organization of the parenthood of the world, that through definite channels of communication every home may be reached.

It joins the hands of parents with educators. It doubles the educational opportunity of the school system without increasing the expense. It stands as the center of education in child nurture for parents, and counts no parents' association of real value unless it gives precedence to the study of the child.

To reach the mothers in the years before school claims the children, it has devised cooperation by organizing parents in the churches for study of child nurture. To apply the knowledge of the greatest leaders in child hygiene to actual life one must reach the homes of the world. The National Congress of Mothers invites your serious investigation as to its methods, and your earnest cooperation in the extension of the cooperation it is already giving to this important cause. "One generation, one entire generation of all the world of children, understood as they should be, loved as they ask to be, and

so developed as they might be, would more than begin the millennium," has been truly said by that lover of childhood, Frances Hodgson Burnett.

Child welfare is at the foundation of world welfare. Child nurture is the greatest science of the age. To arouse the whole world to a realization of its duty to the children, to show that time and money spent on reform could be saved provided every child had the proper treatment in home, school, church, and State, is the propaganda in which all who see the infinite possibilities of the child should unite.

THE CONSERVATION OF THE CHILD.

Dr. Charles Gilmore Kerley, New York City.

One who has followed a great many children in various walks of life from infancy to adolescence has necessarily had definite impressions made upon him in relation to the development of children. My subject, "The conservation of the child," allows me a latitude extending from prenatal life to adolescence. Obviously, in a 20-minute paper, but a few essential principles of so broad a subject may be considered. I will take up those features of a child's management which appeal to me as those most neglected at the present time.

All children, regardless of their social status, are very much alike at birth. All children are born dependent—immature. They do not actually become adults before the seventeenth or eighteenth year of life. There is thus at least 16 years of growth and development, with all that development entails. In the lower animals the reverse is the case. Adolescence is reached much earlier, and the period of dependency of the young upon the parent lasts but a very short time, a few months in some instances and a year or a little longer in others. As a consequence of this order of things, the matter of heredity in the lower animal is a much greater factor than in man. In the human, because of immaturity, dependency, and prolonged development, environment is of much greater import than heredity. Because of the immaturity and the long plastic impressionable period of 16 years, we may mold a child largely as we will, and the fashioning and the molding, whether it be done well, indifferently, or badly, depends more upon the molder and the child's associations than upon the material worked upon.

I have, during my entire professional life of 25 years, been resident or attending physician at children's institutions, from which many hundreds of children have been adopted or otherwise sent out into the world. I have cared for these children from the lower walks of

life, the illegitimate, the offspring of crime, depravity, and poverty in large numbers. I have seen children from such origin well cared for in institutional life, kindly treated, and well started physically, and when adopted or otherwise placed in good homes they have in every way taken and maintained their place with those who had the advantage of everything that is desirable, both as regards birth and environment. Had these children grown up in the more or less careless, if not vicious, environment of their birth, a certain number of the boys would have been members of the various predatory gangs, of which there are many in all large cities and which are schools of crime and preparatory schools for reformatories and prisons. A certain proportion of the girls would have been numbered among the criminal and the depraved. In the school, in college, and in the world, the unfortunate born, if given a fair opportunity, may take as high a position as the better born citizen.

If we reflect a moment, observations such as these tell us that we make in large degree our criminals and the otherwise undesirable of both sexes. And I repeat that, by association, children are fashioned well, indifferently, and badly. If two infants of equal vitality, one born in the palace and one in the poorest tenement, were exchanged on the day of birth, each would work out his destiny along the lines of his environment. The child of the tenement would grow up to the palace and the off-spring of the palace would remain on the level of the tenement environment. I refer now to the great majority of humanity. I realize that there are brilliant exceptions to my theory, but they are so exceptional that they stand out the more prominently. Other States, and lately New York State, have passed laws authorizing the sterilization of criminals and degenerates, with the hope of lessening the progeny of the undesirable. I agree that the purpose of the law, with its attendant good effect, should be carried out, not only because of inheritance, which plays but a small part, but because fewer helpless mites of humanity will be thrown in the environment of their progenitors and grow like them. We forget, in blaming crime, degeneracy, and alcoholism to heredity, that the child lived and grew and got his impressions from that vicious association. The sterilization of criminals and degenerates will not appreciably lessen crime, except in the sense that very few less children will be born. We make no bid for a large birth rate. When children are all properly cared for, then, and then only, can the State ask for an increase in the birth rate. In the human not only do physical qualities in a limited sense admit of inheritance, but also the mentality, as relates to brain capacity, provided the environment is such as to bring out what is best in the individual. Undesirable environment in the clever subject makes our most dangerous criminals.

Character indicates the individual. Heredity has but little influence in determining character. Character, above all things else, is the product of environment.

Degeneracy, crime, and prostitution among the people are, in a large degree, the fault of the State, because those responsible neglect the young, and the State and its representatives attribute crime to inheritance of this oppressed foreign-born individual, and thus shirk the responsibility.

A man was recently murdered in the most prominent part of our principal street of a great city. The perpetrators, the framers of the crime, were not the offspring of criminals. They are the logical product of our handicraft in the management of the young.

No less an authority than Wm. Allen Pinkerton, in the May number of Hampton's Magazine, in the article entitled "Is there a criminal class?" states that there is no criminal class, and that society has begun to learn that one way of preventing boys and girls from becoming criminals is to give them proper care and attention when young. The children's courts that have been established in several cities he believes to be in the experimental stage, but thinks they have already demonstrated their usefulness as a means of diverting youthful offenders from the downward path.

Children's courts are necessary, and it is sad that this is true. When the child is brought to the court for the perpetration of a real crime much damage has already been done. Many of the arrests of children, however, are for trivial offenses, the evidence of superfluous energy, and are of no great significance in criminology.

The remedy for our complaint sounds simple, and yet it is so hard to fulfill. All that any fairly healthy born infant requires, in order to be developed into a responsible citizen, is that he receive, during his plastic period—the period of receptivity—suitable food, clothing, fresh air, adequate rest, right association, right teaching, and kindness. It would seem that every child had a right to demand such simple benefits.

I further learned, in my association with children, that all prefer to be good. The child is by nature happy, impressionable, and irresponsible. Naturally vicious children are degenerates, and defective, vicious degenerates are very few and should be placed by themselves and supplied institutional care and supervision by those skilled in the work. They are in another class from our normal-born child and require no further consideration at this time. In all my entire experience with children I have known just one hopelessly bad boy.

The children of to-day will be the Nation's support and defense a few years later, and when children are not properly cared for and reared it is the duty of the State to adjust the situation to the child's advantage and to its own, a difficult task, but not unsurmountable.

We spend millions of dollars for the maintenance of the abnormal, for the care of drunkards, criminals, imbeciles, insane, and for politicians. Why not expend a little more on the normal child who is not having the possibilities for proper development, namely, right food, clothing, fresh air, and decent association? Our present policy is to let him drift until he becomes a nuisance or a menace and then, having lost a good citizen, we incarcerate and support him for our protection.

Of charitable bodies and associations of different kinds, there are many, and they do good work in spots and bad work in spots, and they are very expensive. In large cities, due to defective general organization, the effort of one association overlaps that of the other. A mother told me last summer that she had three sets of people coming to her house advising her how to bring up her children. Charitable bodies and private societies of different types do estimable work, but they do not even scratch the surface of necessity. These efforts are usually directed in the larger cities, and, while much is accomplished, a great deal more remains undone; and, furthermore, the few large cities are but a small part of the country. This we often lose sight of. In every State there are hundreds of villages of five hundred, one thousand, two or three or ten thousand inhabitants, and smaller cities of a greater number of inhabitants, and millions of square miles of populated open country. These villages, cities, and country districts have growing boys and girls in them, boys and girls who must be amused, entertained, and have a social life which is an absolute necessity of the young. In the absence of something definite to do they amuse themselves. The boys "hang around" the street corners and gradually gravitate to the saloons as they grow older. They have vicious association with those older than themselves, and this forms a large part of the association of many thousands of boys throughout the United States. In the evening the boys and girls congregate on street corners or elsewhere, and this is the first act in the drama.

It has been stated that idleness is the mother of mischief. It may be added that the absence of right amusement is the mother of crime. Do not imagine for one moment that the thousands of women who practice open prostitution in all large cities are bred in the large cities, or that those of either sex who fill our prisons, asylums, and reformatories are all city bred.

If I were given an exceedingly large sum of money and told to spend it to the best of my judgment for the uplift of mankind, I would spend every cent of it, in the cause of humanity and its eternal salvation, through providing entertainment and amusement, and by these means make vigorous bodies and healthy minds. You have

got to accept certain features of the child's equipment as it is. Force, pressure, punishment, and pleading, all useful measures when rightly applied, have proved failures. They do not cover the field. The church and the school, each doing most admirable work in its own way, are not sufficient, and in saying this we judge simply by the results. If, in all the years these measures for the benefit of humanity have been in operation, they had been successful, this paper and many others on similar topics would not be necessary. The best means of approaching the child is through his demand for amusement, which is inherent in him, and through a further trait, the demand for almost incessant occupation when awake. Amusement and entertainment may be made just as educational as we like; in fact, play of the right kind is always educational. Children must be busy, and what is there to do in a city street or in a country village that will make a boy or girl think and best bring out that which is in him?

I was born and reared in the country, but have spent one-half of my life in a large city. Actual amusements arranged for me in my early experience were few, and stand out prominently in my recollection as great events. There was the Sunday-school picnic, if it did not rain on the day appointed; there was the church fair; a circus every two or three years; a county fair held in a neighboring village. These comprise the sum total of the country boy's amusements, excepting those that he makes himself, and my lot was not better or worse than every boy I knew. In the city there are the streets, dangerous and dirty, back yards; and parks, overcrowded and at considerable distance. To-day there are a few playgrounds, established through the efforts of private associations.

If there are the right kind of parents in the home, all may be well. If not, the boy or girl in the city, village, or open country drifts, and often in the way of least resistance, through the current of amusement.

There should be in every city and village, at least for a certain number of inhabitants, a nonsectarian clubhouse and playground, and these are equally as important, as a means of benefit to humanity, as the school or the church. Here, among others, illustrative lectures demonstrating how to live would be given, and this feature could be made most attractive. There would be boys' and girls' clubs for different ages of children. There would be pool and billiards, and cards and dominoes, a library, reading room and smoking room for men, all under the management of the right man, and this would be the opposition of the gin mill.

In order to keep the young from the saloon something must be supplied that is more attractive and which is not hedged in by sectarianism. The clubhouse, when possible, should have spacious grounds for out-of-door sports, under the direction of play in-

structors and amusement directors, and these institutions must be maintained by the state and be operative every day in the year. The cities maintain jails, reformatories, sanatoriums, asylums, and alcohol farms, and they are operative every day in the year. They do not work only on Sundays or five 5-hour days in the week. Instead of telling a boy that he must not play ball on Sundays, develop him so that he will not want to play ball on Sundays by giving him something better (provided, of course, that he should not play ball on Sundays).

It is not necessary that entertainment be all absolute play. Various forms of work for both boys and girls may be made most entertaining, and this comes under the heading of "Occupational amusement." There are 168 hours in a week, allowing 10 hours a day for sleep. We have remaining 98 hours. Allow 3 hours a week for church and Sunday-school service and 35 hours for school work, and we have 60 hours a week unoccupied, and it is these unoccupied hours that must be supervised and provided for 9 months in the year. During the 3 months' vacation practically the entire time is in the child's hands, to follow his own inclinations, and here lies the greatest necessity for supervision.

We maintain, at a great expense, commissions and committees for railroads, for labor, for charities, for the insane, for the river and the harbor, for trust investigations, and so on indefinitely. A commission that we need most of all is a "child protective commission." The commission, through its subordinates, would be required to know and to have authority over every child in the State.

It is only by such means that we will ever solve many of the urgent problems before us. Reform amounts to little. Prophylaxis in medicine has for many years been ardently advocated by our honored chairman in his teachings and writings.

Prophylactic measures against crime, degeneracy, and general worthlessness are the means in the hands of the public for the signal betterment of the race.

A close association and observation of many thousand children from the various walks of life covering many years tells me that in each little human soul there is a spark of the divine, which may be sustained, nurtured by kindness, and fanned by love into responsible man or womanhood.

PRENATAL WORK IN CERTAIN AMERICAN CITIES.

ELLEN C. BABBITT, Russell Sage Foundation, Department of Child-Helping, New York City.

The problem of infant mortality should be studied in two distinct periods—first, the mortality of infants under 1 month of age, and second, the mortality of infants over 1 month of age. The United States census of 1910 showed that 37 per cent—more than one-third—of the total infant mortality in the registration area occurred in infants under 1 month of age. The charts, made by John S. Fulton, M. D., the secretary general of this congress, show graphically the influence of antenatal conditions on the mortality before and after birth.[1]

At the suggestion of the Federal Children's Bureau, this report deals with the mortality under 1 month of age and the means of combating it by the instruction and care of expectant mothers. This is by no means a comprehensive report, but merely a summary of characteristic features of certain cities personally investigated. Similar work is being done in other cities.

METHODS OF WORK.

The general methods of the organizations giving instructions to expectant mothers may be stated as follows, subject to some variation in matters of detail:

Medical directors.—The medical director in charge of the prenatal work in the various organizations is generally an obstetrician, though there are some pediatricians who have undertaken this work—men whose social instincts have led them into this special field of preventive medicine.

Nurses.—The nurses carry out the orders of the physicians, or see that it is made possible for the mothers to carry them out. They are graduate nurses chosen for their special fitness and tact. The nurses need also a knowledge of food values. It is not enough to see that food is provided, in cases of special need, by a relief society; the nurse must see that the food supplied is of the right kind to suit the individual need of each mother, as ordered by the physician.

The nurses visit the expectant mothers in some cities once in 10 days, in others once in 2 weeks, and in others once a month.

Clientèle.—The cases are referred to the various organizations doing prenatal work by hospitals, dispensaries, milk stations, social settlements, and by the various charitable agencies. One serious obstacle is that mothers are late in registering, although the effort is to secure enrollment for as long a period preceding delivery as possible.

In some cities printed leaflets are distributed giving plainly stated advice to the expectant mother; but in many cases they are of little value because of difference in languages.

Instruction.—Instruction is usually given by the physician, either individually or in classes, when the mothers attend the clinics or dispensaries, and is followed up by the nurses in the home. The subjects covered are general and antenatal hygiene, including the need of nourishing food and the value of fresh air, the regulation of exercise, clothing and bathing, and the care of the breasts. Also the physician discusses with the mothers the arrangements for the confinement; whether it shall be in the home or in a hospital; the physician having in view, on the one hand, the advantages of hospital care, and on the other, the disadvantages of taking the mother's moral support away from the home.

The danger of overstrain is obviated in some cities by sending in an extra helper to assist with the heaviest part of the work in the home.

The nurse also encourages the mothers to save small sums all through the pregnancy for the extra expenses of the confinement, lest they suffer from having to meet these expenses by depriving themselves of proper nourishment and extra help in the last few weeks. These savings are made in different ways, as in the "penny savings stamp" books used by Miss Strong in Boston in her settlement work in South End House.

STATISTICAL REPORTS.

The plans and methods of the different organizations have not yet been standardized. The work develops according to the spirit and genius of each. The records are not uniform. It has seemed best, therefore, to present the statistics in the form furnished by the several societies.

NEW YORK CITY.

Caroline Rest.—To the honored chairman of this section, Dr. A. Jacobi, belongs the credit of initiating the movement in New York City. In 1907 Dr. Jacobi called the attention of a group of people to the need of instruction and special care for the mothers of the very poor with newborn babies. This led to the founding of Caroline Rest by Mr. George Schrader, at Hartsdale, near New York. This convalescent home is also a school for mothers, in which, during the weeks following confinement, the mothers are taught how to care for themselves and their babies. It is administered by the New YorkAssociation for Improving the Condition of the Poor. The work has proved highly successful. The results quickly revealed, however, that the association had not reached back far enough, and that much more good might be accomplished if the expectant mothers could be instructed and given care. Caroline Rest nurses were therefore assigned for this purpose. The period for which their statistics are available is the year 1908 to 1909. (Period covered, 12 months.)

Mothers:	
Number visited before confinement	489
Number confined by physician in hospital or home—	
Survived	384
Died in or after confinement	6
Total	390
Number confined by midwife—	
Survived	82
Died in or after confinement	17
Total	99

Pediatric department of New York Outdoor Clinic.—In October, 1908, the pediatric department of the New York Outdoor Medical Clinic undertook a systematic care of the expectant mothers registered. From that date until the 1st of October, 1912, 3,300 mothers have been under their care, to whom visits have been paid once a month. Herman Schwarz, M. D., director of the pediatric department, found that 3 per cent of their women registering were under their supervision before the sixth month of pregnancy; 17 per cent were supervised during the sixth month; 30 per cent registered between the seventh and eighth month; and the remaining 50 per cent during the ninth month.

New York Milk Committee.—In August, 1911, the New York Milk Committee began systematic work for expectant mothers. From August 1, 1911, to June 1, 1912, they had two nurses and one field physician, with two medical directors to supervise the work. Since June 1, 1912, they have added four field nurses and a supervising nurse. (Period covered, 12 months.)

Mothers:	
Number visited before confinement—	
Survived	916
Died in or after confinement	1
Total	917
Infants:	
Number living at end of first month [a]	867
Number died during first month	21
Number of stillbirths	18
Number of miscarriages	15
Total	921

[a] Five pairs of twins.

Infants—Continued.

Number living at end of first month—	
Breast fed entirely	812
Mixed feeding	25
Bottle feeding entirely	30
Total	867

The deaths under 1 month of age were 23.6 per thousand live births, whereas the mortality of infants under a month of age in Manhattan in general was 40.9 per thousand. The stillbirths reported were 19.6 per thousand, while the stillbirth rate in Manhattan in general was 48.6 per thousand.[1]

New York Diet Kitchen.—The New York Diet Kitchen is organizing prenatal instruction, beginning with the negro mothers. They report an encouraging disposition on the part of these mothers to follow instructions.

BOSTON.

Committee on infant social service.—In Boston prenatal work was organized by a committee on infant social service in the Women's Municipal League, in April, 1909, under the chairmanship of Mrs. William Lowell Putnam. This committee has done most effective pioneer work in standardizing and coordinating the work, in the hope, as Mrs. Putnam has said, "that care during pregnancy will become as much a matter of course as it now is during confinement." The printed reports on this work by the committee are valuable.[2] The period covered by their report is from April, 1909, to August, 1913 (three years and three months).

Mothers:

Number visited before confinement—	
8 months	1
7 months	1
6 months	4
5 months	8
4 months	37
3 months	143
2 months	391
1 month	579
Total	1,164
Not stated	197
Total	1,361
Number confined by—	
Physician in hospital	953
Physician in home	211
Total	1,164
Lost sight of before confinement	197
Total	1,361

Mothers—Continued.	
Race:	
White	1,116
Colored	48
Total	1,164
Not stated	197
Total	1,361
Infants:	
Number of still-births	32
Number of miscarriages	3
Total	35

Boston Board of Health.—The Boston Board of Health, in 1910, organized a prenatal and postnatal subdivision of its division of child hygiene. The statistics cover the period from September 1, 1911, to May 1, 1912. (Period covered, 8 months.)

Mothers:	
Number visited before confinement	725
Number confined by—	
Physician in hospital	127
Physician in home	49
Midwife	217
Total	393
Not stated	332
Total	725
Infants:	
Number of births	393
Number of deaths	2
Feeding:	
Breast feeding entirely	302
Mixed feeding	32
Bottle feeding entirely	43
Total	377
Not stated	16
Total	393

Pregnancy clinic of Boston Lying-in Hospital.—The pregnancy clinic of the Boston Lying-in Hospital was organized May 5, 1911. The period covered in their report is from May 5, 1911, to December 31, 1911. (Period covered seven months.)

Mothers:	
Number supervised	1,106
Died in or after confinement	6

Mothers—Continued.	
Number confined by—	
Physician in hospital	246
Physician in home	698
Total	944
Not stated	162
Total	1,106
Race:	
Native white	79
Colored	7
Foreign	420
Total	506
Not stated	600
Total	1,106
Number unmarried	17
Infants:	
Full term—	
Number living at end of first month	898
Number died during first month	5
Total	903
Premature—	
Number living at end of first month	3
Number died during first month	4
Total	7
Stillbirths	30
Miscarriages	6
Grand total	946

South End House.—South End House, one of the social settlements, began systematic work in May, 1910. Miss Mary L. Strong, the visiting nurse, has the work in charge. She reports on the plan of work there, as follows:

1. Trying to make all recognized forces doing maternity preparation more effective by supplying the varying details which of necessity have been omitted. (These are generally confidential, spiritual, or home-making details.)
2. Trying to stimulate into existence more of such forces for prenatal work.
3. Trying to put within reach of the fathers and mothers concerned an intelligent understanding of these forces and their value, and trying to help them choose wisely in their preparation for the child's coming. This sort of guidance divides itself naturally into three interests: (*a*) The economic; (*b*) the hygienic; (*c*) the imaginative.

Miss Strong says of the educational work done for fathers:

We try to make him feel that the baby is to be a veritable social investment, into which he must be willing to put thought, time, and money at the start, if

he wishes it to be a good and repaying venture. It may be a late date at which to begin eugenics, but if his sense of protective watchfulness can be stirred to conserve the strength of the mother for the good of the child, then he has dignified himself anew.

Statistics of South End House show (period covered, one year):

Mothers:	
Number visited before confinement—	
9 months	6
8 months	10
7 months	4
6 months	27
5 months	20
4 months	10
3 months	6
2 months	1
1 month	4
Total	88
Number confined by—	
Physician in hospital	18
Physician in home	35
Number survived	53
Lost sight of before confinement	10
Pending	25
Total	88
Race—	
Native white	37
Colored	2
Foreign	14
	53
Not stated	35
	88
Number unmarried	2
Infants:	
Number living at end of first month	51
Number died during first month	1
Number stillbirths	1
	53

BALTIMORE.

Maryland Association for the Study and Prevention of Infant Mortality.—In Baltimore parental work was undertaken by the Maryland Association for the Study and Prevention of Infant Mortality February 1, 1912. They visit and instruct all women registered in four leading hospitals. In their report on prenatal work the period covered is from February 1 to September 1, 1912 (period covered, seven months):

Mothers:	
Number visited before confinement—	
8 months	5
7 months	7
6 months	15
5 months	27
4 months	58
3 months	105
2 months	128
1 month	256
Total	601
Number survived	278
Died in or after confinement	5
	283
Died before confinement	3
Lost sight of before confinement	71
Pending	239
Not stated	5
Total	601
Number confined by—	
Physician in hospital	30
Physician in home	241
Midwife	12
Total	283
Race—	
Native white	186
Colored	298
Foreign	117
	601
Number unmarried	116
Infants:	
Full term—	
Number living at end of first month	241
Number died during first month	0
Total	241
Premature—	
Number living at end of first month	2
Number died during first month	3
Total	5
Still births	29
Miscarriages	8
	37
Grand total	283

Infants—Continued.	
Supervised until 1 month old:	
Breast feeding entirely	219
Mixed feeding	11
Bottle feeding	11
Total	241

CHICAGO.

Mary Crane Day Nursery.—In Chicago, the Mary Crane Day Nursery began prenatal work July 22, 1912, for the women of the Hull House neighborhood. Expectant mothers come three days a week, at 9 a. m. They are instructed from 9 to 12, while their older children are at school and their little ones in the day nursery. First the physician, then the nurse, sees the mother. Then comes class work under the domestic teacher. The following is the

Tentative course of instruction.

I. The house. (Talks, discussions, and illustration.)
  1. Essentials in selection of rooms.
     As to neighborhood conditions.
     As to light, air, etc.
  2. Furnishing.
  3. House sanitation.
II. Food. (Talks and practice.)
  1. Composition and function.
  2. Selection, storage, and care.
  3. Preparation of food.
  4. Diets:
     General.
     Invalid. (Special emphasis placed upon their own present needs.)
     Infant.
III. Clothing. (Practical work in sewing room.)
  1. Materials.
  2. Darning and mending.
  3. Making of garments.
IV. Family budgets.
V. Hygiene. (Given by nurse and doctor—talks, demonstration, and practice.
  1. General. (As to cleanliness, air, habits, and so forth.)
  2. Special. (Due to special condition.)
  3. Infant.

At noon the mothers gather with their families for the simple, wholesome meal provided for them. Following this comes a social hour, after which the older children go back to school and the mothers and babies have a rest hour in the open air. Later there is another lesson either in cooking or sewing or hygiene, and then the mothers go home in good season with their children.

ST. LOUIS.

Visiting Nurse Association.—The Visiting Nurse Association of St. Louis has carried on prenatal work as part of its daily routine since January 1, 1911. (Period covered, 19 months.)

Mothers:

Number visited before confinement—	
8 months	2
7 months	1
6 months	1
5 months	10
4 months	32
3 months	88
2 months	97
Total	231
Time not stated	341
Total	572
Number confined by physician at home—	
Survived	569
Died in or after confinement	3
	572
Race—	
Native white	258
Colored	225
Foreign	89
	572

	Number living at end of first month.	Number died during first month.	Total.
Infants:			
Full term	a 534	24	558
Premature	6	3	9
	540	27	567
Stillbirths			9
Total			576
Supervised until 1 month old—			
Breast feeding entirely	393	6	399
Mixed feeding	80	9	89
Bottle feeding entirely	67	12	79
Total	540	27	567

a Two sets of twins, both living; one set triplets, 2 living, 1 died first week.

Social service department of Washington University.—In St. Louis the social service department of Washington University undertook, May 1, 1912, to send a nurse to visit all women who register in the obstetrical clinic. The statistics given are for the three months, May, June, and July, 1912. (Period covered, 3 months.)

Mothers:	
Number registered	190
Confined by—	
Physician in hospital	37
Physician in home	55
Midwife	2
Number survived	94
Lost sight of before confinement	42
Not stated	54
	190
Race—	
Native white	27
Colored	42
Foreign	25
	94
Not stated	96
	190
Unmarried	12
Infants:	
Full term—	
Number living at end of first month	94
Number died during first month	1
Total	95
Premature—	
Number living at end of first month	2
Number died during first month	2
Total	4
Stillbirths	3
Miscarriages	4
	7
Grand total	103

MILWAUKEE.

Milwaukee Maternity Hospital.—In Milwaukee the Milwaukee Maternity Hospital and Free Dispensary Association "aims to have the prospective mothers report each week to the dispensary for examination by the physician." Their statistics show (period covered not stated):

Mothers:	
Number confined by—	
Physician in hospital	260
Physician in home	276
	536

Mothers—Continued.	
Race—	
Native white	236
Foreign	300
	536
Number unmarried	93
Infants:	
Full term—	
Number living at end of first month	491
Number died during first month	7
Total	498
Premature—	
Number living at end of first month	13
Number died during first month	3
Total	16
Stillbirths	22
Miscarriages	6
	28
Grand total	542

Visiting nurses' associations.—The visiting nurses' associations in Chicago and in Buffalo have done prenatal work as a part of their regular routine, but their statistical records were not available for this report.

The District Nursing Association in Fall River has been doing excellent work in caring for the expectant mothers during the summer of 1912, of which the records are not as yet in shape for publication, but which show gratifying results.

Statistics.—The statistics as furnished by the various organizations in the different cities are tabulated in different ways, so that it is impossible to give a general brief summary of the results of their prenatal work. It is possible, however, to compare the stillbirth rate and the rate of mortality in the first month among the mothers who were supervised and the general population, both in Boston and New York.[4]

	Stillbirths per 1,000 confinements.	Deaths under 1 month per 1,000 births.
Boston:		
Expectant mothers supervised (by the pregnancy clinic of the Boston Lying-in Hospital)	31.9	10.0
City of Boston	39.8	45.7
New York:		
Expectant mothers supervised (by the New York Milk Committee)	19.6	23.6
Borough of Manhattan	48.6	40.9

This experience in Boston and New York indicates that where expectant mothers have had continued medical supervision, including the work done by the nurses who visit them in their homes, both the stillbirth rate and the rate of mortality in the first month have been appreciably reduced.

At the request of this department, Mr. Ethelbert Stewart has reviewed the statistical statements furnished by the various organizations, and summarized them as follows:

In the preliminary study of the work for expectant mothers by agencies organized for that purpose in the United States, seven such organizations were visited. There are a number of others, not visited. The length of time for which they were under supervision was obtained from only three of these institutions. The records of these three do not cover the length of supervision of all cases in charge, as they had 2,337 cases under their care, but the length of the supervision is shown for only 1,992. Of those cases, where a definite period of supervision can be shown, the Visiting Nurse Association of St. Louis had 231; the committee on infant social service, of the Women's Municipal League of Boston, 1,160; the Maryland Association for the Care and Prevention of Infant Mortality, Baltimore, 601. Only the Baltimore association has complete records for all of its enrolled expectant mothers. The Visiting Nurse Association of St. Louis, out of 572 cases, gave the time of supervision for only 231. Boston was practically complete, having records for 1,160 out of 1,164. The St. Louis association gave 10 mothers' supervision for five months 32 for four months, 88 for three months, and 97 for two months. The Boston committee gave 37 cases five months' supervision, 143 four months', 391 three months', and 579 two months' supervisory care. Baltimore gave five months' care to 27, four months' to 58, three months' to 105, two months' to 128, and one month's care to 256 cases. Of the 1,992 cases cared for by the three institutions, and covered by their time records, 8 were given eight, 9 were given seven, 24 were given six, 74 were given five, 233 were given four, 584 were given three, 804 were given two, and 256 were given one month's care.

These general facts, so far as could be obtained from the records, are brought out in Table I.

The most striking result of the preliminary survey is the need of uniform records and a due appreciation of the value of statistics as a record of the success of such institutions.

Table II brings out the statistics of confinement, so far as the inadequate records or returns from the records will permit. Not all of the institutions are represented in this table, as the records submitted furnished no data. It should be especially emphasized that there is no way to connect the information in Table I with that in Table II. For instance, Table II shows that of 572 mothers visited in St. Louis, 24 of the children born died during the first month, and 9 were stillborn. But there is no way to connect these facts with the length of prenatal supervision given these mothers. All the way through this lack or correlation between one set of figures and another shows the need of educating those in charge of such institutions to see the value of properly kept statistical data, if these institutions are to become efficient as mortality-reducing agencies.

In addition to the above, Table II takes 3,950 mothers, supervised by five institutions, and attempts to give the number of full-term births, premature births, stillbirths, and miscarriages, the number living at the end of the first month, etc., as clearly as it was possible to develop the facts from the returns

given. That the figures do not agree still further emphasizes the necessity of statistical care in keeping the records of such institutions.

Mr. Stewart adds:

It would seem to be the part of wisdom to draft a form of statistical record to be submitted to all institutions looking after expectant mothers, and to urge them to keep their records on a uniform basis; at least to urge them to couple up the length of prenatal care with the condition of the child and its subsequent record, such as weight of child at birth, whether breast fed, and so forth. From the viewpoint of a statistician, not much can be said for these institutions until this correlation of prenatal care with subsequent facts is more complete.

TABLE I.—*Number of expectant mothers visited in specified cities and institutions.*

Number of months before confinement.	St. Louis. [a]	Milwaukee. [b]	New York. [c]	Boston. [d]	Boston. [e]	Boston. [f]	Baltimore. [g]	Total.
Eight	2			1			5	8
Seven	1			1			7	9
Six	1			8			15	24
Five	10			37			27	74
Four	32			143			58	233
Three	88			391			105	584
Two	97			579			128	804
One							256	256
Total	231			1,160			601	1,992
Time not stated	341	507	917	4	1,106	725		3,600
Grand total	572	507	917	1,164	1,106	725	601	5,592

[a] Visiting Nurse Association.
[b] Maternity Hospital.
[c] Milk committee.
[d] Committee on infant social service, Women's Municipal League.
[e] Pregnancy clinic, Boston Lying-in Hospital.
[f] Division of child hygiene, health department.
[g] Maryland Association for the Study and Prevention of Infant Mortality.

TABLE II.—*Number of infants.*

Institution and city.	Number of mothers visited.	Full term.		Premature.				Total.
		Living at end of first month.	Died during first month.	Living at end of first month.	Died during first month.	Still-born.	Miscarriages.	
St. Louis [a]	572	534	24	6	3	9		576
Milwaukee [b]	507	491	7	13	3	22	6	542
Boston [c]	1,164					32	3	
Boston [d]	1,106	898	5	3	4	30	6	946
Baltimore [e]	601	241		2	3	29	8	283
Total [f]	3,950	2,164	36	24	13	122	23	2,347

[a] Visiting Nurse Association.
[b] Maternity Hospital.
[c] Committee on infant social service, Women's Municipal League.
[d] Pregnancy clinic of the Boston Lying-in Hospital.
[e] Maryland Association for Study and Prevention of Infant Mortality.
[f] Discrepancies in these figures may be due to pending cases, births of twins and triplets, and to incomplete returns.

[1] In article on the "Necessity for minute study of the age-incidence of causes of infant mortality," in Proceedings of the American Association for Study and Prevention of Infant Mortality, Vol. I, 1910.

[2] Of all the record forms seen those used by the New York milk committee are the most complete and satisfactory.

[3] The following reprints have been published by the committee: Reports of Boston Prenatal Work, November, 1910; Reports from April to October, 1911; An Experiment in Preventive Work with Mothers and Babies; Prenatal and Postnatal; Prenatal Care and its Effect in Supplanting the Midwife, from the Point of View of what Laywomen can Accomplish, by Mrs. Putnam, 1911.

[4] It is to be noted that the New York Milk Committee takes all cases, those attended by midwife as well as those under medical care, and that the period covered in its report is from August 1, 1911, to August 1, 1912. The pregnancy clinic of the Boston Lying-in Hospital report covers only those cared for in the hospital or by the clinic, and the period covered in their report is from May 5, 1911, to December 31, 1911.

INFANT MORTALITY AND ITS RELATION TO THE EMPLOYMENT OF MOTHERS IN FALL RIVER, MASS.[1]

Mr. CHAS. H. VERRILL, United States Bureau of Labor.

It has often been the subject of comment both here and in other countries, notably in England, that in cities where a large proportion of the women are industrially employed a high rate of infant mortality—that is, under 1 year—is almost always found. Nearly all of the cities which are centers of the textile industries are conspicuous for a high mortality at all ages, and especially for a high mortality under 1 year. Because of this almost constant relation of the extensive employment of women and a high infant mortality, it has often been assumed that the excessive infant death rates in industrial localities are chiefly due to the industrial employment of the mothers.

In order to test the validity of this assumption or to ascertain the real causes of the high infant mortality in such cases an investigation in detail of the conditions in a textile city where the industrial employment of women is almost exclusively in that industry seemed the most feasible method. Of all American textile cities, Fall River seemed to be the most suitable for such a study. In 1905 nearly 17,000, or 38.6 per cent, of the women 10 years of age and over were gainfully employed, and nearly 13,000, or 29.8 per cent, were employed in cotton mills. Of this number approximately one-third were married or widowed. The death rate at all ages in Fall River for the 10-year period 1900 to 1909 was 20.3 per 1,000 of the population, and in 1908 it was 20.5. In the same 10-year period, out of every 100 deaths 38.4 were those of children under 1 year, and in 1908 36.6 per cent were children under 1 year. The general death rate, it should be noted, was one of the highest prevailing in any northern city, and the same is true of the percentage of deaths under 1 year. The birth rate also was extraordinarily high, being 43 per 1,000 of population in 1908.

The striking feature of the Fall River infant mortality figures, not only in 1908 but in each year of the 10-year period 1900 to 1909 as well, is the great number of deaths due to diarrhea, enteritis, and gastritis, this group of causes being accountable for 38.3 per cent of all deaths under 1 year in 1908 and for 36.7 per cent during the 10-year period.

The main question for investigation then was whether the high infant mortality in Fall River is due directly or indirectly in an important degree to the industrial employment of mothers. Obviously such an investigation called for a study of the causes of death among the children of mothers employed outside the home in comparison with the children of mothers at home. The effect of the mother's work outside the home and of the withdrawal of the mother's care, if the effect was at all marked, should be apparent from a comparison of the deaths due to various causes among the two classes of children.

For the purposes of the investigation the year 1908 was selected. Copies were made of the official records of all children dying under 1 year from any cause in Fall River, and of all stillbirths. Visits were then made to the homes of the children by experienced agents of the Bureau of Labor,[2] and detailed inquiries were made concerning the employment of the mother, the time of discontinuing work before the birth of the child, the time of resuming work after the birth of the child if work was so resumed, the character of the feeding of the child, the care given to the child, especially during any absence of the mother at work, and various other matters tending to throw light in any way upon the direct or indirect causes of death. Much difficulty was found in tracing some of the families and in securing accurate information from the mother and other members of the family. Doctors were interviewed when possible for supplementary information.

Of the 859 children dying under 1 year in Fall River during 1908 the desired particulars were obtained concerning 580, and of the 227 stillborn children recorded particulars were obtained concerning 165. Of the 580 children dying under 1 year whose families were interviewed it was found that in the case of 266, or 45.9 per cent, the mothers during the period of pregnancy were at work outside the home, while in the case of 314 the mothers were not at any time during that period at work away from home. Of the 165 mothers of stillborn children who were traced, 69, or 41.8 per cent, had been employed at some time during pregnancy. From 279 of the children born living and for 62 of the stillborn the family could not be found and the information which is here available is therefore limited to the details given in the official records.

The representative character of the cases concerning which detailed information was secured is indicated by a comparison of the causes of death and of the country of birth of the parents of the children. No significant differences were found between the 580 children for whom particulars were obtained and the 279 whose families could not be found.

The first result of a study of Fall River infant mortality figures and a comparison with those of other localities is to establish beyond question the fact that the Fall River rates are excessive. In Fall River the death rate under 1 year per 1,000 births in 1908 was 177.6, while in 1910 in the Borough of Manhattan it was 135, in Boston 126, in England and Wales (in 1908) 120,[3] and in Blackburn, England, an important English textile city somewhat larger than Fall River, 157 (for a 10-year period).

A comparison limited to a study of the per cent of deaths due to the more important causes quickly shows that the proportion of deaths due to diarrhea, enteritis, or gastritis in Fall River in 1908 was 37 per cent above that in the registration area of the United States in 1908, 37 per cent above that in the Borough of Manhattan, and 46 per cent above that in Boston in 1910, 114 per cent above that in England and Wales in 1908, and 131 per cent above that for 10 years in Blackburn.

Comparison of per cent of total deaths under 1 year due to diarrhea, enteritis, and gastritis in Fall River and in other localities.

Locality.	Per cent of deaths under 1 year due to diarrhea, enteritis, and gastritis.	Per cent of excess in proportion of deaths due to diarrhea, enteritis, and gastritis in Fall River over locality specified.
Fall River, 1908	38.3	.....
Registration area, United States, 1908	27.9	37
Manhattan Borough, 1910	27.9	37
Boston, 1910	26.3	46
England and Wales, 1908	17.9	114
Blackburn, England, 1901–1910	16.6	131

A comparison on the more exact basis of death rates per 1,000 births makes a very much more unfavorable showing for Fall River, its rate for diarrhea, enteritis, and gastritis being then, for the periods named above, 81 per cent above that for the Borough of Manhattan, 105 per cent above that for Boston, 215 per cent above that of England and Wales, and 161 per cent above that of Blackburn, England, for a 10-year period.

Comparison of death rates per 1,000 births from diarrhea, enteritis, and gastritis, and from nondiarrheal diseases in Fall River and in other localities.

Locality.	Death rate under 1 year per 1,000 births.			Per cent of excess of Fall River death rates under 1 year per 1,000 births over city specified.		
	Diarrhea, enteritis, and gastritis.	Nondiarrheal diseases.	All causes.	Diarrhea, enteritis, and gastritis.	Nondiarrheal diseases.	All causes.
Fall River, 1908	68.1	109.5	177.6			
Manhattan Borough, 1908	37.6	97.0	134.6	81	13	32
Boston, 1910	33.2	92.8	126.0	105	18	41
England and Wales, 1908	21.6	98.7	120.3	215	11	48
Blackburn, England, 1901–1910	26.1	130.9	157.0	161	[a] 20	13

[a] Per cent of excess of Blackburn over Fall River rate.

When we compare the death rates per 1,000 births at various ages under 1 year in Fall River and in certain other localities we find that the Fall River rate under 1 month is not excessive, corresponding almost exactly with that for England and Wales, but that at ages over 3 months the Fall River rates are very greatly excessive.

Comparison of death rates at different ages under 1 year per 1,000 births, Fall River, Mass.; England and Wales; and Blackburn, England.

Locality.	Under 1 month.	Under 3 months.	3 months and under 6 months.	6 months and over.	Total.
Fall River, 1908	40.5	72.3	46.9	58.4	177.6
England and Wales, 1908	40.3	64.4	23.6	32.4	120.4
Blackburn, England, 1910	46.1	69.5	25.1	41.4	136.0

The comparisons between Fall River and localities having a more favorable infant mortality rate indicate quite clearly that wherever death rates are excessive the excess is largely to be accounted for by a high rate from diarrheal diseases. This of itself shows that such excessive rates are largely preventable. The additional fact that wherever rates are excessive the greatest differences exist at ages over 3 months shows again that to a considerable extent the high rates are due to preventable causes.

It is possible to throw light upon the situation by turning to English experience, where figures are available covering a period of years, to show the causes where organized effort has resulted in the greatest improvement in the infant death rates. Here, a comparison of the rates from 1901 to 1909 show in the most striking way the reduction in death rates that has been brought about within that brief period. While the greatest reduction, a reduction of 45 per

cent (1909 compared with average 1901–1904), has been brought about in death rates from diarrheal diseases, the improvement in practically all of the other causes also is very great and even in death rates from the developmental and wasting diseases of earliest infancy a reduction of 6 per cent has been brought about.

Per cent of reduction in death rates at different ages under 1 year per 1,000 births, between 1901–1904 and 1909, England and Wales, by causes.

Cause of death.	Per cent of total deaths under 1 year due to specified cause, 1901–1904.	Per cent of reduction in death rates, 1909 compared with average, 1901–1904.			
		Under 3 months.	3 months and under 6 months.	6 months and over.	Total under 1 year.
Developmental and wasting diseases [a]	33	5	19	14	6
Diarrheal diseases [b]	19	36	47	50	45
Convulsions	11	31	38	41	34
Tuberculosis (all forms)	4	41	38	31	35
Pneumonia, bronchitis, and laryngitis	17	20	21	16	18
All other causes	17	18	27	23	22
Total	100	15	33	29	22

[a] Includes premature birth, congenital defects, want of breast milk, injury at birth, atrophy, debility, and marasmus.
[b] Includes diarrhea, enteritis, gastroenteritis, gastrointestinal catarrh, gastritis, and gastric catarrh.

The importance in Fall River of the mothers industrially employed outside the home before childbirth, as related to the infant mortality in 1908, is indicated by the fact that of the 580 reported 266, or 45.9 per cent, were so employed, and 314, or 54.1 per cent, were at home.

The importance of the mothers employed outside the home after childbirth and while the child was living, as related to the infant mortality of Fall River, is indicated by the fact that of the 578 reported, 83, or 14.4 per cent, were so employed. This number is subject to further qualification in certain respects, because of the fact that out of this 83 only 41 were at the time just prior to their return to work nursing their children. The other 42 had either never nursed their children or had previously discontinued nursing for reasons having no relation to their return to work.

Work on the part of the mother before the birth of the child, whether in the home or industrially, if involving strain or exhaustion, and especially if continued too near childbirth, might be expected to increase stillbirths, and deaths due to premature birth, congenital malformation and defects, congenital debility, and other diseases, but in less degree.

The causes of death above named are chiefly important in earliest infancy, and if the mother's work before the birth of the child was a

seriously injurious influence in any considerable number of cases, that fact should be disclosed in a study and comparison of the deaths of children of the two classes, mothers at home and mothers at work.

A comparison of the children of mothers at home and of mothers at work shows that when all causes of death are considered a slightly greater percentage of the children of mothers at home died during the first week, during the first month, and during the first three months of life. This will be best seen in the following table:

Per cent of deaths from all causes under 1 year occurring under 1 week, under 1 month, and under 3 months, for children of mothers at home and of mothers at work.

Work of mother before birth of child.	Per cent of total deaths under 1 year which occurred—		
	Under 1 week.	Under 1 month.	Under 3 months.
Mothers at home	12.1	24.8	42.9
Mothers at work	10.2	22.2	41.4

A slightly higher percentage of stillborn children is found in the case of mothers at home, 23.4 per cent of the deaths of the children of mothers at home being stillbirths, while for the children of mothers at work only 20.6 per cent were stillbirths. In order to ascertain whether the apparently greater importance of stillbirths among the children of mothers at home is due to the severity of work or to other causes, an attempt was made by inquiry in the home to ascertain in as many cases as possible anything in the work of the mother, her condition, or the conditions in the home to which the stillbirth of the child might be attributed.

Among the mothers at home the stillbirth could be traced to the mother's work in only 9 cases, the cause in 7 cases being the severity or unsuitable character of the work, and in 2 cases the continuance of the work too near childbirth. In addition to the 7 stillbirths due to the character of the mother's work, there were 3 cases where the mother had been employed in the mill during pregnancy but where the stillbirth was due directly to housework at home after leaving the mill. The 7 stillbirths apparently traceable to the mothers' work constituted 12 per cent of the total of 58 mothers at millwork from whom detailed information was secured. Among the mothers at home in 10 cases the stillbirth was apparently traceable to the character of the mother's work, and in 2 cases to its continuance too near childbirth. These 10 cases, it should be said, included 3 cases of mothers who had been employed in the mill but had given up millwork in expectation of childbirth and were engaged only in house-

work. These 10 cases constitute 13 per cent of the 75 mothers at home (72 at home plus 3 at work in mill and later at home).

Comparing further the per cent of stillbirths traceable to sickness or ill health of the mother, it is seen that the 12 cases among mothers at work constituted 22 per cent of the total for whom reports were received, and the 20 cases among mothers at home constituted 27 per cent of the total mothers at home.

These comparisons would seem to indicate that so far as stillbirths were traceable to a cause, the work of the mother in the mill and sickness or ill health of the mother so employed were not responsible for stillbirths in any greater degree among the mothers at work than among the mothers at home. It is necessary to point out, however, that the facts as presented here can hardly have an exact value, as the causes can not be known of a certainty in all these cases. Moreover, it is probably true that in a number of cases the reported sickness or ill health of the mother at home was due to former employment in the cotton mill, although it is necessary to say that no such case was identified among any of the mothers included in this table. Furthermore, sickness and ill health are not uncommon among women who are not employed in severe labor, either in the factory or in the home, and many such cases are due to obscure causes. Some also, as here, among both mothers at work and mothers at home are due to accidents or improper treatment of previous births.

The condition of the children at birth, which may be taken as an index of the effect of antenatal influences, will be indicated by the percentage of total deaths which were due to the diseases of early infancy (premature birth, congenital malformation, and congenital debility under 3 months). A comparison is made in the following table for the children of mothers at home and of mothers at work:

Per cent of total deaths under 1 year (not including stillbirths) which were due to diseases of early infancy (premature birth, congenital malformation, and congenital debility under 3 months) for children of mothers at home and of mothers at work.

Work of mother before birth of child.	Total deaths, all causes.	Deaths due to diseases of early infancy.				
		Premature birth.	Congenital malformation.	Congenital debility under 3 months.	Total.	
					Number.	Per cent of total deaths, all causes.
Mothers at home	314	16	8	49	73	23.2
Mothers at work outside the home	266	20	4	31	55	20.7
Total	580	36	12	80	128	22.1

From these figures it appears that while deaths from premature birth and congenital malformations together were relatively more numerous among the children of mothers at work, yet when the deaths from congenital debility under three months are added, the children of mothers at home made a distinctly unfavorable showing—23.2 per cent against 20.7 per cent.

The large per cent of children dying from various causes during the early weeks of life suggests that many of the children were not well and strong at birth, due, perhaps, among other causes, to the injurious influence of the mother's work. In the course of the investigation an attempt was made by questioning the mothers of the children to ascertain the number of those dying under 1 year who at birth were not well and strong. Information so obtained, while based in many cases upon the statement of the physician to the mother, would in many other cases rest largely upon the mother's judgment.

Number and per cent of children dying under 1 year (not including stillbirths), from specified causes, who were reported as not well and strong at birth, according to work of mother.

Cause of death.	Total children dying under 1 year.	Children not well and strong at birth.	
		Number.	Per cent.
Mothers at home:			
Premature birth and congenital malformation	24	24	100.0
Congenital debility	77	46	59.7
All other causes	206	45	21.8
Total, all causes	306	115	37.
Mothers at work:			
Premature birth and congenital malformation	24	24	100.0
Congenital debility	53	30	56.6
All other causes	178	51	28.6
Total, all causes	255	105	41.2

According to this table, 59.7 per cent of the children of mothers at home dying from congenital debility were reported as not well and strong at birth. Of the children of mothers at work dying from the same cause, 56.6 per cent were reported as not well and strong at birth. Of the children of mothers at home dying from all other causes (excluding birth and congenital malformations), 21.8 per cent were reported as not well and strong at birth, as compared with 28.6 per cent of the children of mothers at work. Taking together all the children of mothers at home, 37.6 per cent were reported as not well and strong at birth, as against 41.2 per cent of the children of mothers at work.

Apparently, then, antenatal conditions of some kind have resulted in a slightly larger percentage of children not well and strong at birth

among the group "children of mothers at work" than among the children of mothers at home. Among the children dying of congenital debility, however, where the fact should be especially noticeable, the percentage is slightly higher for children of mothers at home.

Examining the two groups, "mothers at home" and "mothers at work outside the home" more in detail with reference to the work of the mother, a comparison may be made of the children not well and strong at birth (including both those born living and the stillborn) in relation to the whole number of children dying under 1 year, including stillborn.

Number and per cent of total children dying under 1 year (including stillborn) who were reported as well and strong at birth, not well and strong at birth, and stillborn, according to work of mother before birth of child.

Work of mother before birth of child.	Number.				Per cent.			
	Children well and strong at birth.	Children not well and strong at birth.		Total.	Children well and strong at birth.	Children not well and strong at birth.		Total.
		Born living.	Stillborn.			Born living.	Stillborn.	
Mothers at home:								
At housework only	182	112	93	[a] 387	47.0	29.0	24.0	100.0
At other work	5	1	2	8	62.5	12.5	25.0	100.0
At no work	4	2	1	7	57.1	28.6	14.3	100.0
Total	191	115	96	[a] 402	47.5	28.6	23.9	100.0
Mothers at work outside the home before birth of child:								
At cotton-mill work	136	96	65	[b] 297	45.8	32.3	21.9	100.0
At other work	14	9	4	[c] 27	51.9	33.3	14.8	100.0
Total	150	105	69	[d] 324	46.3	32.4	21.3	100.0
Grand total	341	220	165	[e] 726	47.0	30.3	22.7	100.0

[a] Not including 8, child's condition not reported.
[b] Not including 9, child's condition not reported.
[c] Not including 2, child's condition not reported.
[d] Not including 11, child's condition not reported.
[e] Not including 19, child's condition not reported.

Here, as in the preceding comparison, a slightly larger per cent of the children of mothers at work are found reported as not well and strong at birth. This excess is slightly increased if the comparison be restricted to the two more important classes, "mothers at housework only" and "mothers at millwork." For the former class 53 per cent of the children were reported as not well and strong at birth, and for the latter class 54.2 per cent. The significance in these figures appears to be not in the slight excess of children not well and strong at birth for the mothers at work, but in the fact that for the mothers at home the percentage is practically as high, plainly indicating that if there is an injurious effect of millwork, there must also be in many of these cases an effect almost in the same degree injurious resulting from the work at home. In making this state-

ment it is, of course, necessary to remember that to an extent which can not be accurately measured the group "mothers at home" includes women who were in early life engaged in millwork and are perhaps still subject to the effect upon their health of this earlier work.

Perhaps quite as important as the character of the work of the mother is the length of time before birth of child that the mother stopped work. For the mothers at home the question is difficult of an answer which is of value. A very large number reported that housework was continued up to the day of birth. For very many of these this did not mean severe or long-continued work. For others the hardest kind of work was reported, and premature births and stillbirths could be traced directly to this cause. For the most part, however, the time of discontinuance of work before the birth of the child can not be regarded as significant as here reported in the cases of mothers at home. For the mothers at work, however, conditions are quite different. Here in nearly all cases the mothers were employed outside the home in cotton-mill work, and continued at their usual mill duties up to the day shown in the table.

Number and per cent of total children dying under 1 year (including stillborn) who were reported as not well and strong at birth for mothers at home and mothers at work, according to length of time before birth of child that mother stopped work.

Length of time before birth of child that mother stopped work.	Mothers at home.					Mothers at work outside the home before birth of child.				
	Total children, including stillborn.	Children not well and strong at birth.				Total children, including stillborn.	Children not well and strong at birth.			
		Number.			Per cent.		Number.			Per cent.
		Born living.	Stillborn.	Total.			Born living.	Stillborn.	Total.	
Under 4 days	271	71	59	130	48.0	14	6	5	11	78.6
4 days and under 1 week	5	2	.....	2	40.0	2	1	1	2	100.0
1 week and under 2 weeks	33	11	9	20	60.6	11	3	2	5	45.5
2 weeks and under 3 weeks	7	1	3	4	57.1	32	11	10	21	65.6
3 weeks and under 1 month	1	1	.....	1	100.0	5	.....	3	3	60.0
1 month and under 2 months	5	2	.....	2	40.0	31	10	5	15	48.4
2 months and under 3 months	2	1	.....	1	50.0	54	14	10	24	44.4
3 months and under 4 months	3	1	.....	1	33.3	37	9	8	17	45.9
4 months and under 5 months	1	1	.....	1	100.0	28	11	3	14	50.0
5 months and under 6 months	1	.....	1	1	100.0	16	6	3	9	56.3
6 months and over	9	5	.....	5	55.6	73	28	11	39	53.4
Total	338	96	72	168	49.7	303	99	61	160	52.8
Time of stopping work not reported	64	19	24	51	79.7	21	6	8	14	66.7
Total	[a] 402	115	96	219	52.5	[b] 324	105	69	174	53.0

[a] Not including 8 children, condition at birth not reported.
[b] Not including 11 children, condition at birth not reported.

For the mothers at home it will be seen that in 271 out of 338 cases reported work was continued up to within 4 days of childbirth, while for the mothers at work outside the home out of 303 cases reported, 14 worked up to within 4 days, 27 less than 2 weeks, and 64, or 21 per cent of all, less than 1 month. For the mothers at home the per cent of the children who were not well and strong at birth was not higher than the average, even in the group working up to within 4 days of childbirth. For the mothers at work outside the home, those continuing work up to within a month or less of childbirth show an excessive percentage of children not well and strong at birth. In all the groups discontinuing work at an earlier date the percentages were below the average, save in the last two groups, where it was only slightly in excess.

It has appeared from the foregoing tables that in a comparison of the condition at birth of children of mothers at home and mothers at work approximately the same percentages were not well and strong at birth. Inquiries were made attempting to trace, so far as possible, any apparent relation between the child's condition at birth and the mother's work. Such relationship, however, except in a small proportion of cases, is difficult to trace, for the causes responsible for cases of premature birth, congenital malformation, or a condition of weakness at birth are often exceedingly obscure and very complex. It can not be supposed that what is here presented is more than suggestive of the causes which are operating in the two classes, "mothers at home" and "mothers at work," to produce a condition of weakness or ill health in the child at birth.

Of the 302 children dying under 1 year whose mothers were engaged in housework at home, the condition of 53 children not well and strong at birth was traced to an apparent cause. The child's condition in 14 cases was due to injury at birth or difficult birth; in 14 cases to the sickness or ill health of the mother, and in 9 cases to the character of the mother's work. These 9 cases, however, include 5 cases where the mother was employed during pregnancy outside the home, but where it could be stated definitely that the child's condition at birth was due directly to overwork at home after leaving the mill. In these cases the overwork of special importance was heavy washing and lifting in connection with the same.

Of the 243 children of mothers engaged in millwork outside the home, 42 cases of children not well and strong at birth could be traced to an apparent cause. In 15 cases this cause was the sickness or ill health of the mother, in 11 cases it was the character of the mother's work, and in 9 cases where it did not appear that the character of the mother's work was especially unsuitable and injurious, it did appear quite clearly that it was continued so long and so near child-

birth as to be directly responsible for the child's weakness or ill health at birth.

Summarizing the results of the study of the effect upon the children of the mother's employment before childbirth, the conclusion must be reached that in Fall River, as indicated by this one year's experience, no marked differences are discoverable between the children of mothers at home and those of mothers at work outside the home. A slightly larger per cent of stillbirths was reported for the mothers at home, but the per cent of the stillbirths which could be traced to the mother's work was the same for mothers at home and for mothers at work. The percentage of total deaths due to diseases of early infancy (indicating prematurity, immaturity, or defects) was higher for the children of mothers at home than for the children of mothers at work. The percentage of children not well and strong at birth (stillbirths included) was almost exactly the same for mothers at home and for mothers at work. It would appear, then, that the conditions which were found existing do not indicate that the work of the mother in the cotton mill before childbirth was producing results noticeably different from the work of mothers at home. It must be borne in mind, however, that the two classes, mothers at work and mothers at home, are not sharply defined and that the group, mothers at home, always includes a considerable number of women who were formerly engaged in millwork and whose physical condition may still be affected in some degree by such earlier employment.

In regard to the relation of the mother's work outside the home after childbirth to the high infant mortality in Fall River, the question of first importance, of course, is, In what proportion of the cases of children dying under 1 year did the mother work outside the home after childbirth, thus depriving the child of the mother's care? The answer to this question will give the measure of the maximum possible effect of the mother's work outside the home after childbirth upon the infant mortality. The results of this investigation show that in Fall River, in 1908, only 83, or 14.4 per cent, of the 578 children dying under 1 year, concerning whom information could be secured, were deprived of the mother's care because of her going to work after childbirth.

Among these mothers who went to work after childbirth nearly all the races are represented, in much the same proportions as in the much larger group of mothers at work before childbirth. While it is apparent from the smaller number of children which they had borne that for the groups, as a whole, the mothers at work before childbirth were younger than the mothers at home, yet among these mothers who went to work after childbirth, in certain cases the aver-

age number of children is so large as to indicate women no longer young. Thus, the 18 French-Canadian mothers show an average of 7.1 children, the 6 English mothers 6.8 children, and the 4 Irish mothers 6.3. The Portuguese mothers, 27 in number, showed an average of only 3.4 children. This comparatively low average was no doubt due to the fact that the Portuguese cotton-mill operatives in Fall River are largely recent immigrants, and as most of them came to this country seeking work in the cotton mill it is, of course, to be expected that they are nearly all comparatively young.

It has been shown that only 83, or 14.4 per cent, of the 578 mothers reporting went to work outside the home after childbirth and while the child was living. Of this number, 11 (13.4 per cent) went to work during the first month and 17 (20.5 per cent) during the second month. Of the mothers at home, a great majority resumed work within one month.

In the absence of the mother, where the mother went to work, the care of the child was by the grandmother in 25 cases, by some other relative in 22 cases, and by a friend, neighbor, or hired attendant in 29 cases.

In the table which follows the causes of death of the children of mothers who went to work outside the home after childbirth are shown in comparison with the causes in the case of (1) the children of the mothers who were at home both before and after childbirth, and (2) the children of the mothers who were at work outside the home before the birth of child, but did not return to work after childbirth.

Number and per cent of children dying under 1 year from certain specified causes, classified according to the mother's work before and after childbirth.

NUMBER.

Employment of mother after birth of child and while child was living.	Diseases of early infancy and congenital malformation.	Diarrhea, enteritis, and gastritis.	Convulsions.	Nontuberculous meningitis.	Pneumonia, bronchitis, and laryngitis.	Tuberculosis (all forms), whooping cough, measles.	All other causes.	Total, all causes.
Mothers at home before birth of child and not going to work	102	[a] 106	22	1	51	7	20	[c] 309
Mothers at work outside the home before birth of child, but did not return to work after childbirth	67	66	8	1	29	.....	15	186
Mothers at work outside the home before birth of child and returned to work after childbirth	13	[b] 52	2	.....	13	.....	3	[b] 83
Total	182	224	32	2	[c] 95	7	38	[c] 580

[a] Not including 5 children of mothers at home before birth of child who went to work outside the home after childbirth.

[b] Including 5 children of mothers at home before birth of child who went to work outside the home after childbirth.

[c] Including 2 children not reported whether mother returned to work after childbirth.

Number and per cent of children dying under 1 year from certain specified causes, etc.—Continued.

PER CENT.

Employment of mother after birth of child and while child was living.	Diseases of early infancy and congenital malformation.	Diarrhea, enteritis, and gastritis.	Convulsions.	Nontuberculous meningitis.	Pneumonia, bronchitis, and laryngitis.	Tuberculosis (all forms), whooping cough, measles.	All other causes.	Total, all causes.
Mothers at home before birth of child and not going to work	33	34.3	7.1	0.3	16.5	2.3	6.5	100
Mothers at work outside the home before birth of child, but did not return to work after childbirth	36	35.5	4.3	.5	15.6	.....	8.1	100
Mothers at work outside the home before birth of child and returned to work after childbirth	15.7	62.7	2.4	.....	15.7	.....	3.6	100

Comparing the causes of death of the three classes of children, the striking similarity between the two groups of children whose mothers were at home after childbirth is first to be noted. Diarrhea, enteritis, and gastritis were accountable for 34.3 per cent of the deaths among the children of mothers at home both before and after childbirth, and 35.5 per cent among the children of mothers who were at work outside the home before the birth of child but who did not return to work after childbirth. The deaths from diseases of early infancy constituted 33 per cent in the former group and 36 per cent in the latter group. On the other hand, turning to the children of mothers at work after childbirth, it is found that 62.7 per cent of all deaths were due to diarrhea, enteritis, and gastritis.

It will be noticed that the per cent of deaths due to diseases of early infancy and congenital malformations are much higher among the children of mothers who did not return to work. The explanation of the difference in this latter case is in the fact that most of the children dying from this group of causes died within the early weeks of life before it was possible for the mother to leave the home and go to work.

The high percentage of deaths from diarrheal diseases among children of mothers at work outside the home is not peculiar to mothers native of any one country, but for every country the percentage is in excess of the corresponding percentage among children of mothers at home.

Artificial feeding was much more general among the children of mothers at work than among the children of mothers at home. The same percentage of the children were fed on fresh cow's milk (9.8 per cent), although when we consider those who were given cow's milk and at the same time nursed, a much greater use of cow's milk is found among the mothers at work than among the mothers at home. The use of condensed milk is also more general among the mothers at work than among the mothers at home. The use of con-

densed milk among the mothers at home also exceeded the use of cow's milk. While 24.4 per cent of the mothers at home admitted giving solid food, among the mothers at work the percentage rose to 40.2.

The relation of the high percentage of deaths from diarrhea, enteritis, and gastritis to artificial feeding is brought out by the excess of the artificial feeding among the children who died from the diarrheal diseases, as compared with the children dying from other causes.

Number and per cent of children dying under 1 year from diarrhea, enteritis, and gastritis who were given each specified kind of food, classified according to mother's work after childbirth.

NUMBER.

Character of food.	Mothers at home after childbirth.			Mothers went to work outside of home after childbirth.			Total.		
	Deaths from diarrhea, enteritis, and gastritis.	Deaths from other causes.	Deaths from all causes.	Deaths from diarrhea, enteritis, and gastritis.	Deaths from other causes.	Deaths from all causes.	Deaths from diarrhea, enteritis, and gastritis.	Deaths from other causes.	Deaths from all causes.
Nursing exclusively	38	111	149	1	.....	1	39	111	150
Cow's milk	9	34	43	5	3	8	14	37	51
Cow's milk and nursing	12	12	24	8	2	10	20	14	34
Condensed milk	19	23	42	6	5	11	25	28	53
Condensed milk and nursing	12	15	27	9	5	14	21	20	41
Proprietary foods	9	9	18	.....	.....	.....	9	9	18
Proprietary foods and nursing	20	8	28	3	2	5	23	10	33
Other foods (usually solid foods) with any or all of preceding	12	10	22	7	5	12	19	15	34
Other foods (usually solid foods) with any or all of preceding and nursing	35	50	85	13	8	21	48	58	106
Total	166	272	438	52	30	82	218	302	520

PER CENT.

Nursing exclusively	22.9	40.8	34.0	1.9	.....	1.2	17.9	36.8	28.8
Cow's milk	5.4	12.5	9.8	9.6	10.0	9.8	6.4	12.3	9.8
Cow's milk and nursing	7.2	4.4	5.5	15.4	6.7	12.2	9.2	4.6	6.5
Condensed milk	11.4	8.5	9.6	11.5	16.7	13.4	11.5	9.3	10.2
Condensed milk and nursing	7.2	5.5	6.2	17.3	16.7	17.1	9.6	6.6	7.9
Proprietary foods	5.4	3.3	4.1	.....	.....	.....	4.1	3.0	3.5
Proprietary foods and nursing	12.0	2.9	6.4	5.8	6.7	6.1	10.6	3.3	6.3
Other foods (usually solid foods) with any or all of preceding	7.2	3.7	5.0	13.5	16.7	14.6	8.7	5.0	6.5
Other foods (usually solid foods) with any or all of preceding and nursing	21.1	18.4	19.4	25.0	26.7	25.6	22.0	19.2	20.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The children of mothers at work, when compared with the children of mothers at home, show an excessive percentage of deaths from diarrheal diseases, regardless of the character of the food, suggesting that a lack of care or improper care, as well as the difference in the feeding, played an important part. This is shown in the following table:

Per cent of total deaths due to diarrhea, enteritis, and gastritis among children given each specified kind of food, classified according to mother's work after childbirth.

Character of food.	Mothers at home after childbirth.			Mothers went to work outside the home after childbirth.			Total.		
	Deaths, all causes.	Deaths from diarrhea, enteritis, and gastritis.		Deaths, all causes.	Deaths from diarrhea, enteritis, and gastritis.		Deaths, all causes.	Deaths from diarrhea, enteritis, and gastritis.	
		Number.	Per cent of deaths, all causes.		Number.	Per cent of deaths, all causes.		Number.	Per cent of deaths, all causes.
Nursing exclusively	149	38	25.5	1	1	100.0	150	39	26.0
Cow's milk	43	9	20.9	8	5	62.5	51	14	27.5
Cow's milk and nursing	24	12	50.0	10	8	80.0	34	20	58.8
Condensed milk	42	19	45.2	11	6	54.5	53	25	47.1
Condensed milk and nursing	27	12	44.4	14	9	64.3	41	21	51.2
Proprietary foods	18	9	50.0	.....	.....	.....	18	9	50.0
Proprietary foods and nursing	28	20	71.4	5	3	60.0	33	23	69.7
Other foods (usually solid foods) with any or all of preceding	22	12	54.5	12	7	58.3	34	19	55.9
Other foods (usually solid foods) with any or all of preceding and nursing	85	35	41.2	21	13	61.9	106	48	45.3
Total	438	166	37.9	82	52	63.4	520	218	41.9

The lowest percentage of deaths from diarrheal diseases uniformly appears among children who were breast fed exclusively.[4] Next to these, children using fresh cow's milk showed much the lowest percentage of diarrheal deaths, the figures being 27.5 per cent against 45.3 per cent for solid food and nursing, the next higher, and 47.1 per cent for condensed milk. The highest, 69.7 per cent, was for proprietary foods and nursing, the next highest being 58.8 for cow's milk and nursing.

When the children of mothers at work are studied a somewhat different order appears, cow's milk exclusively and solid food and nursing both showing a very high percentage of diarrheal deaths. For the former class, however, it should be noted that the figures are rather small, as indeed they are for all the classes in the mothers at work group. It is probable that the much more unfavorable showing for cow's milk here is due to inferior quality and especially inferior care of the milk. A similar explanation may also account for the more unfavorable showing for condensed milk. It is likely that the lack of the mother's care, as well as the lack of her nursing, is an important factor here.

The very considerable number of deaths from diarrheal diseases among children who were given only mother's milk ought not to excite surprise, although it is doubtless unnecessarily large. Even

among breast-fed children the channels of possible infection are numerous. Where only breast milk is given and there is no possibility of infection through unclean food, infection might easily be introduced by means of the fingers or articles put into the mouth, both of which would often be unclean from dust or dirt from the clothing, the furniture, or the floor. All this would be true even in homes where a fair standard of living and of hygiene was maintained. The dangers in overcrowded, insanitary dwellings located in insanitary surroundings would be vastly increased.

The Polish mothers led all others in nursing, 55.6 per cent of their children being breast fed exclusively, against 33.6 per cent of the French Canadians and 27.4 per cent of the Portuguese. Only 16.7 per cent of the Irish children were nursed exclusively.

In the use of cow's milk the Polish mothers are in the lead, with 27.8 per cent, the Irish coming next with 22.3 per cent, the Portuguese mothers being last with only 12.1 per cent.

The Irish mothers appear as using condensed milk most generally (38.9 per cent), the Americans being next with 23.6 per cent.

The Portuguese mothers led all others in the use of solid foods, 44.7 per cent of all admitting giving them either with or without breast feeding. A considerable number of cases were also found among the French Canadians and the Americans.

The principal excuses or reasons for not nursing for the 218 mothers at home who nursed a part of the time only or not at all were: No milk or milk deficient, 59.6 per cent, and illness or disability of mother or child, 26.1 per cent. For 14, or 6.4 per cent, it was reported that milk was present, but no good reason for not nursing could be given. For the 81 mothers who went to work who nursed only a part of the time or not at all, the most important cause was naturally the intention to go to work, which was given by 39, or 48.1 per cent. Next in importance as a reason was "no milk or milk deficient," 33.3 per cent. In the case of 11, or 13.6 per cent, it was admitted that milk was present, but no good reason was given for not nursing.

The illness or disability of the mother or child as a reason for not nursing was a much more important cause with the mothers at home than with the mothers at work. This, however, is what one would expect, inasmuch as mothers seriously ill would, of course, be unable to go to work. It is not at all unlikely that a similar reason explains the excess of those reporting no milk or milk deficient among the mothers at home. The degree of ill health might result in a deficiency of milk and also cause the mother to remain at home, even though the incapacity might not be sufficient to cause it to be reported as the main reason for not nursing.

If the two classes, "disinclination of mother" and "milk present, no reason given for not nursing," be regarded as the same, this reason accounts for 8.7 per cent among the mothers at home and 13.6 per cent among the mothers at work.

It is probable that in some of the cases where the mother reported no milk or milk deficient the actual reason for the failure to nurse the child was her own ignorance or disinclination. The experience of physicians has shown that such reports can not be accepted as conclusive, and that in many cases where the mother states that she has no milk for her child a fair trial proves the contrary.

The disinclination of the mother does not appear as an acknowledged reason of failure to nurse the child save in 5 cases (including 3 among mothers at home and not nursing at all). It is almost certain, however, that this was the real reason in others of the 28 cases where milk was present and a more or less unsatisfactory reason for not nursing was given. Among these 28 mothers were 11 who later went to work. The period which elapsed before their going to work in these cases was as follows: Two at two weeks, 1 at three weeks, 4 at one month, 3 at three months, and 1 at four months. In 8 of these cases the excuse given was that the mother expected to return to work within a short time. It is clear that such a reason can not be accepted as expressing the full truth when the return to work was postponed one and even two months. In one case where the return to work took place in three weeks the excuse frankly given was the disinclination of the mother.

"Going to work" was given as an excuse or reason for shortening the period of nursing in only 40 cases, or 13.4 per cent of the total number who nursed only a part of the time or not at all. In these cases the breast feeding which was given for a time was discontinued because the mother went to work outside the home. In the 1 case where the mother went to work but continued nursing exclusively it is clear that the child would be unfavorably affected by the necessarily infrequent feeding. These cases, it may be noted, constituted only 7.9 per cent of the total of 520 for whom information in regard to feeding was obtained. The significance of this percentage is in the fact that it shows what part of the entire number of children had their period of nursing shortened by the fact that the mother went to work outside the home.

To sum up, then, such conclusions as clearly appear from the study of Fall River experience in regard to the relation of the mother's work outside the home after childbirth to the high infant mortality in that city, only 83, or 14.4 per cent of all children dying under 1 year, were found to have been deprived of the mother's care because of her going to work. This per cent represents the extent of the possible effect of the mother's absence from home.

But the extent to which the nursing of the child was affected by the mother's going to work is smaller than even this figure indicates, for in only 41 cases, or 7.9 per cent of all, was the mother's nursing in any way affected by her absence from home, and in the 42 other cases she either failed to nurse because of disinclination or inability or had discontinued nursing for reasons not in any way connected with her return to work.

But while the number and per cent of children affected by the mother's absence from home was small, yet the causes of death among this number, as compared with the causes among children whose mothers remained at home, show strikingly the fatal effect in these few cases of the mother's absence and of the lack of her care and nursing. Thus the proportion of deaths from diarrhea, enteritis, and gastritis among the children whose mothers went to work (62.7 per cent) was over 80 per cent in excess of that of the children whose mothers remained at home (34.6 per cent).

The real significance of this excess will not be fully realized until we recall the figures before given, showing that for Fall River as a whole the death rate under 1 year from diarrhea, enteritis, and gastritis was two or three times what it was in many other localities.

The high infant mortality of Fall River as a whole clearly is not due, except in very small part, to the excessive rate among the children of mothers at work outside the home, for the proportion of deaths due to diarrhea, enteritis, and gastritis, 38.6 per cent of all, for the city as a whole, only falls to 34.6 per cent when the children of mothers at home are taken separately.

What, then, it will be asked, are the causes of the excessive infant mortality in Fall River, an excess already seen to be chiefly in the deaths due to diarrhea, enteritis, and gastritis? The causes of the excessive mortality under 1 year in Fall River among the children of mothers at home are to be found in the absence of nursing and in the improper feeding and improper care, of which there are many examples. The much higher mortality among the children of the mothers who went to work after childbirth is plainly due chiefly to the greater extent of the absence of breast feeding and of the improper feeding and the additional evil influence of the withdrawal of the mother's care.

Among the mothers at home only 34 per cent of the children were nursed exclusively, while 24 per cent were given solid food, and for 16 per cent condensed milk was the principal food. Among the children of the mothers who went to work only 1.2 per cent were nursed exclusively, while 40 per cent were given solid food, and for 30.5 per cent condensed milk was the principal food. By both classes of mothers condensed milk was used more generally than fresh cow's

milk. In over one-third of the cases where solid food was given its use was begun during the first week.

The large percentage of artificial feeding was found to be due to a considerable extent to deficiency of breast milk, which was much more frequent among the mothers at home than among those who went to work, but in many cases among the latter this artificial feeding was not due to a deficiency of breast milk, nor was it in any way a result of the mother's going to work.

The causes of the excessive infant mortality in Fall River may be summed up in a sentence as the mother's ignorance of proper feeding, of proper care, and of the simplest requirements of hygiene. To this all the other causes must be regarded as secondary.

---

[1] Based on Report of Commissioner of Labor on Condition of Woman and Child Wage Earners in the United States (61st Cong., 2d sess., S. Doc. No. 645), Vol. XIII, Infant Mortality and its Relation to the Employment of Mothers.

[2] Probably it is important in presenting the results of an investigation of this kind and in this place to emphasize the method of securing the data. For in work of this kind reasonably reliable data can be secured only by visits to the homes, and even then agents of experience and judgment must be employed. The three agents who were engaged in the collection of the data in this investigation had had considerable previous training in the field work of the Bureau of Labor, and one of them, Dr. Laura M. Keisker, in immediate charge of the field work, was also a physician of experience.

[3] For comparison with the Fall River figures of 1908 those for England and Wales in the same year are taken. In 1909 and 1910 the rates for England and Wales were considerably lower than in 1908, namely, 108.73 and 105.44, respectively, per 1,000 births, and the death rates from diarrheal diseases were correspondingly lower (12.64 in both 1909 and 1910). For Manhattan Borough and for Boston figures for 1910 were taken as likely to be more nearly correct than those of earlier years. The rates in 1908 in these cities were: Manhattan Borough, 136; Boston, 149.

[4] The exception among children of mothers at work may properly be ignored in this connection, as there was only a single instance.

THURSDAY AFTERNOON, SEPTEMBER 26, 1912.

FIELD WORK IN TUBERCULOSIS.

MARY E. LAPHAM, M. D., Highlands Camp Sanatorium, Highlands, N. C.

It is, of course, unquestioned that tuberculosis is the greatest menace to the health and development of the human race, and within recent years campaigns for its eradication have been inaugurated and carried on not only by the medical profession, but by societies organized among the laity for the prevention and cure of the disease. We have each year in a great many of the large cities Tuberculosis Day, upon which funds are solicited to aid in the fight, and State and municipal authorities support camps and sanitariums for those unable to bear the burden of treatment in private institutions.

All these efforts are, however, directed toward the eradication of manifest tuberculosis, and the prevention of infection, by these manifest cases, of other individuals not supposed to be infected. Practically no steps are being taken to discover the concealed but active cases of tuberculosis which are constantly with us drifting, for lack of discovery and proper care, surely into manifest cases, which may not be discovered until they have progressed so far that the life of the patient is in immediate danger.

We regard the danger from tuberculosis as comparable to that from other contagious diseases, as smallpox, for instance; and if there is no consciousness of exposure there is no thought of danger. We do not fear tuberculosis without proximate cause any more than we do smallpox.

Hospitals and pathological institutes tell another story. There we learn that from infancy to old age tuberculosis is always with us; that in one form or another it influences our development in every conceivable way, morally, mentally, and physically, and affects us in all conceivable degrees, from harmless, inactive latency to fatal phthisis. The danger from tuberculosis exists from the first breath we draw unto the last. The infection is not vanquished once and for all, but is perpetually resident and must be perpetually resisted, for as long as there is life there is danger from tuberculosis, and this danger does not come entirely from without, but equally from within.

Manifest tuberculosis as we see and know it is not the beginning, but the end. It is the final manifestation of the activities of the tubercle bacilli. When these first settle down in the lung tissues they may not be able to exercise any of their activities. We have the presence of tubercle bacilli within the lungs, but they produce no tuberculous changes of any extent and no effects either local or general.

This inactive or latent tuberculosis is harmless enough as long as inactive, but the danger is that some day this latency will disappear and tuberculous activities develop. The X-ray may show an apparently harmless and quiescent lesion and yet the nutrition of every part of the body be injured by its presence. Because there are no physical signs in the lungs, we call this condition concealed but active tuberculosis, meaning thereby that we can not ascertain anything from the lungs, and can only detect the infection by its general manifestations and by tuberculin reactions. The existence of concealed tuberculosis may manifest itself only in an alteration in the character, intellect, or physical development of the patient until enough changes have been produced in the lungs to cause physical signs when we have clinical or manifest tuberculosis.

The records of the attacks made upon us by the tubercle bacilli and our resistance to these attacks show that 90 per cent of all children who live to the age of 15 years are infected. What, therefore, is to become of these cases? Some will surely develop into manifest cases and cause the death of the patient; others may survive after a protracted struggle and years of ill health; while the majority will probably never be affected by the infection.

We call this obliviousness to the infection immunity; and the ability to produce and maintain immunity will, in my opinion, be the salvation of the race against the dread pest of tuberculosis.

How, therefore, are we to produce this immunity? The majority of those infected will immunize themselves and maintain this immunity throughout life. We will recognize and combat those that develop into manifest cases after they have become manifest, which, in a great many instances, will be too late, but nothing is now done for the majority of concealed and latent cases. We see only those failing to produce or maintain immunity after the failure has become obvious as a manifest case, but these are nothing compared with the number of lives beset with difficulties and bad health because of the unsuspected presence of tubercle bacilli, poisoning their very springs of existence.

The ability to produce and maintain immunity varies, of course, with the conditions of life, the general health, and the strain to which the individual is subjected. Because of school, parties, and dancing, the child is tired out. There is not time in the morning for breakfast, and little appetite for it, because the child was up late the night before. At school a cold luncheon is perhaps taken, and after school the dinner "put up to keep warm" does not seem very appetizing, so that at the end of the school day the child is often completely tired out and insufficiently fed. This is repeated day after day, and as a consequence, tired with study, insufficiently fed, with no attention paid to rest, one school girl after another goes dancing to her doom.

Primarily, it is not the fatigue and lack of food, rest, and fresh air that is responsible for her downfall. The primary underlying fault is the inability of the individual to produce and maintain an immunity that under any and all conditions will triumph over this active but concealed tuberculosis.

We see plenty of children exposed to precisely these same conditions, but they do not succumb because their immunity protects them. This flaw is more or less pronounced among our children, but it does not show until developed by strain. In all probability these cases furnish the material for the future crops of manifest tuberculosis. It can not be too greatly emphasized that the degree of immunity at any particular moment is a very uncertain quantity in this class of cases. Success or failure is not decided at any one time, but may alternate from infancy to old age. One attack after another may be more or less successfully resisted and clinical tuberculosis not appear until 30, 40, 50, 60, or 70 years of age, or not at all. Just as we see immunity raised and lowered again and again in manifest tuberculosis, so does it vary in concealed cases. The inability to produce a complete and lasting immunity in childhood furnishes the supply for the tuberculosis victims of the future. If we could detect these concealed cases in childhood and establish this immunity that is so natural to most of us, we would thereby accomplish a great deal toward the eradication of manifest tuberculosis among adults in the future.

A certain percentage of children fail to produce sufficient immunity. This is bad enough in itself, but the worst feature is that this condition may exist with no striking symptoms to call attention, until it may be too late, as from a miscroscopic nodule the process may extend over a whole lobe or almost over a lung without causing symptoms sufficient to attract attention. If we could detect these cases and put them under proper conditions we could, I believe, raise their immunity until it would, in the vast majority of cases, persist and be a permanent protection.

It is only the remnant in which the immunity fails. If we could bring and maintain this small minority up to where we stand there would be no more tuberculosis. This applies all through life. When the mechanism is imperfect, failure to maintain resistance is imminent at every moment. This failure is undoubtedly present among us in this room at this very moment in a certain number of cases, and because of the lack of manifestations consciousness of the danger will not be aroused until it is actively and disastrously apparent.

This percentage is small, but it is the base of supply from which is drawn the future victims of tuberculosis and it is this fundamental flaw that has to be corrected if the children are to remain unaffected by tuberculosis throughout life. The correction of this fault is the keynote to the fight against tuberculosis.

How can this be done? Eventually we shall confer an artificial immunity just as we do now on typhoid. Among 80,000 troops, stationed under the most diverse circumstances, there have been only five deaths from typhoid from January until June, 1912, and four of these had not been protected by artificial immunity. We can not at present confer artificial immunity against tuberculosis as we can against typhoid, although we are fast approaching the solution of the problem. In the meantime, there are two cardinal points to consider. First, we should detect as early in life as possible the children failing to produce immunity. Second, we should raise this immunity to the highest possible point. The child, unable to protect itself against tubercle bacilli, does not show this inability in any marked way. There are often no gross manifestations, but simply a failure to develop properly. There is a lack of initiative, ambition, and persistency. Failure to keep a normal weight and lack of strength are the commonest and may be the only expressions of concealed tuberculosis, notwithstanding the universal dogma that any tuberculosis of the lungs will so manifest itself as to be capable of detection through a physical examination of the lungs. This belief of the medical profession is entirely erroneous and very dangerous, indeed, and I wish most emphatically to impress this meeting with the fact that an individual may be seriously affected with concealed active tuberculosis and not manifest any symptoms that can be detected by a physical examination of the lungs.

The questions which present themselves for our solution are, therefore—

First. How can we discover the children or adults failing to produce immunity and in whom there exists, of course, concealed tuberculosis, which will almost surely develop into manifest tuberculosis unless discovered and combated in time?

Second. Having discovered these concealed cases, how can we combat them in the most practical and successful manner? Sometimes even manifest tuberculosis is not easily discovered, and it will be readily seen that the discovery of concealed tuberculosis is far more difficult, and particularly so to persons not especially trained in that direction.

I would, therefore, most strongly advocate a campaign by the government of each State, acting through a board of experts especially trained in the detection and treatment of tuberculosis, whose duty it would be to search out concealed as well as manifest cases of tuberculosis, with power to furnish proper care and treatment to all patients unable to procure such from their private resources, and also with sufficient power to enforce this care and treatment among all classes.

The expense of conducting such a campaign is as nothing compared to the loss sustained by the present method of fighting this disease, which never attacks the enemy until it has such a grasp upon the patient as to incapacitate him from work and seriously threaten his very life. The saving to the State in money and human effort, by finding and stamping out these concealed cases, would be in as great proportion as that made by the modern automobile fire engine, which rushes to the scene of trouble in time to smother the little blaze before it has a chance to become dangerous, instead of merely trying to save the surrounding property, as was the case in the old volunteer hand-engine days.

Now we fight only manifest cases of tuberculosis, which is comparable to trying to put out the fire after it has attained the proportions of a dangerous conflagration. What we should do is smother the numberless concealed cases before they have a chance to burst into flame, and this, I believe, can only be done by boards of experts, acting under the express authority of the State.

Best of all, if our National Government would undertake a campaign against tuberculosis, and endeavor to exterminate it by establishing a national board of experts, working in harmony with a board of experts in each State, we could study tuberculosis thoroughly in two ways. First, we could discover the extent of the infection and its relation to human sources. It is now almost universally believed that the infection is due entirely to human dissemination. The source of the infection is regarded as entirely from other cases, and our efforts at preventing the spread of the infection are all based upon this fundamental belief. We must carefully provide for the present victims of the disease, but we must see to it that the future sacrifices are prevented. If we come to believe that extinguishing human sources of infection will not suffice to extinguish the disease, then we will be forced to realize that our only way of preventing future suffering will be to prevent the development of concealed cases of tuberculosis into manifest ones by the conference of immunity, if possible, and by the regular treatment of tuberculosis until that happy day comes. A chain of State laboratories, working under the coordinated guidance of the national board of experts, would be a powerful instrument to detect the cause of tuberculosis and the conference of immunity. If the United States would spend a million dollars this next year in studying the beginnings of tuberculosis, so that these concealed cases would be discovered and saved, the investment would yield such large returns in money saved that all the data and all the educational value acquired would be obtained for nothing. The education of the people and the profession would result in an ability to detect and recognize concealed tuberculosis that in a few years would put the whole question of tuberculosis in

an entirely different light. To go on as we are doing is like waiting for uremic convulsions before recognizing kidney disease. To wait for the manifestation of tuberculosis is to allow the activities of the tubercle bacilli full opportunity to do their work, while we do nothing until driven to it by the bitterness of impending death. From latency to clinical tuberculosis we stand idly by and wait, while for years the tuberculous process extends, weaving its threads throughout the lungs until we think the proper time has come for us to undertake the rescue. The proper time is at the beginning and not at the end, before anything has been lost, instead of waiting until there is nothing to save.

THE PRESERVATION OF THE TEETH IN SCHOOLS IN GERMANY, AND THE WORK OF THE GERMAN CENTRAL COMMITTEE FOR DENTAL HYGIENE.

Dr. KONRAD COHN, Zahnarzt Berlin, Germany.

The very great extent to which caries of the teeth is prevalent in childhood we may take at the outset as a well-known fact. Röse and others in Germany proved clearly by their examinations of school children 15 or 20 years ago that about 90 per cent of children suffer from decayed teeth. In reports, too, of school medical men on the state of health of school children one ever comes across the remark that the teeth of the children are, in the great majority of cases, in a rather bad condition. As the statistics in the first examination were simply obtained by counting the decayed teeth, their worth has lately been severely criticized. I therefore proposed that the statistics should be so taken that the condition of the remaining teeth of children should be noted and determined at certain stages during their school career. Fessen, of Strassburg, acting on my suggestion, examined 2,332 eight-year-old children of national schools and 719 children of the same age of higher schools, and found that the condition of the first remaining molars and of the milk molars gave the following results:

In the case of national school children, of the first remaining molars, over 52 per cent were sound, 8 per cent were filled, over 29 per cent were slightly and nearly 8 per cent were completely decayed, and over 3 per cent had been extracted.

In the case of children attending higher schools the condition was better, and showed especially far more signs of dental treatment (16 per cent filled as against 8 per cent in the other case).

The results I obtained in a Berlin girls' school were far more unfavorable. Here the 8-year-old girls had only just under 15 per cent sound first molars, while about 78 per cent were already decayed.

Not one of the children had been treated by a dentist. These facts show how urgent is the necessity of moving against this deplorable state of things, and one can not shut his eyes to the urgency of fighting caries of the teeth, not only from the point of view of health, but also of social interest. It would, however, take far too much time to go into minute particulars of the influence of decayed teeth on the health of mankind. It is not a rare occurrence in Germany for this influence, especially with regard to the condition of nutrition of the child, to be pronounced on the part of medical men of schools as non-existent and incapable of proof. That the condition of children, in spite of bad teeth, can be as good, as regards nutrition, is traceable partly to the fact that stomach and intestines are able, for a long time, to counteract the loss of the teeth. I myself, however, believe that the consequences of a diminished power of mastication, from a nutritive point of view, do not show themselves on the stomach and intestines until much later. How far decayed teeth can be brought into connection with general illness has become a much-debated question, and throwing light on it here would take too long a time. It has been proved that the ulceration of the so common fistulas on the gums is a by-no-means blameless incident, as the statements of Flügge show, who looks upon pus as an important source of very virulent streptococcus, which in manifold ways can exercise its baneful influence on the individual himself or, in consequence of dissemination, also on others. Carbuncles and inflammation of the middle ear, and so forth, appear, according to Flügge, to be caused amongst school children in this way. It is certainly a hygienic duty to put an end to this source of puscoccus amongst children living together in the schools and playgrounds.

The outlet (of the cavity) of the mouth in the pharynx is surrounded by a sort of wreath of lymphatic glands, which act as a protection against the entry of bacteria through the mucous membrane of the mouth.

It is by no means a matter of indifference whether these lymphatic glands be forced to preventive measures in consequence of decayed teeth, and themselves become so worn out in the struggle that when an incursion of very deadly bacteria—tubercle bacilli, for example—takes place they are not capable of their proper power of resistance. In this manner decayed teeth, in consequence of their effect on the mucous membrane of the mouth and on the lymphatic glands near, can make the way easy for tuberculosis into the interior of the body.

As a conclusion to my introductory remarks, I should like to point out further that it is not only of importance from the social point of view, but also from the economical, to take measures for their systematic preservation of the teeth from childhood. Then, too, the adult can not maintain his social position with a neglected mouth and

bad teeth, as such a condition is offensive to people who place some value on the external appearance of the body.

Neglect of the care of the teeth in childhood is the cause of greater cost for artificial substitutes in later life. It is therefore clearly indicated then that purely for reasons of economy we should begin even in childhood's days to set to work prophylactically.

I will now devote myself to my principal theme: "The preservation of the teeth in German schools and the doings of the central committee intrusted with its care." The first men who worked in this field, and Jessen in particular, deemed it necessary to open up connections with schools, and laid themselves out to bringing this to pass. The proper care of the teeth by the individual himself is the most important factor, and that this care must be instilled into him as a part of his education. This education can then be best ingrained through the school.

There is now much talk of the care of the teeth in schools, and of school dental clinics, and so forth. Jessen, in Strassburg, sought and obtained connection with the school authorities, and the success obtained there after 10 years' work has made itself decidedly felt and is to be traced partly to the instruction given on the importance of the teeth, and to the admonition on the part of the teachers. In order to introduce this care of the teeth on a large scale in Germany, the German central committee was started at the instigation of Ministerial Director Kirchner. The principal task of the central committee consists in awaking the interest of State as well as of municipal authorities, in the scholastic and medical professions, and finally amongst the people themselves, as to the importance of care of the teeth of children whilst at school. It is not, however, the task of the central committee to fit up school clinics out of its own funds, for this must always be left from the very beginning to the towns themselves.

Local committees are appointed whose duty it is to undertake all local work and to become responsible for the fitting up of the school clinics, and the financing and maintenance of such a clinic is always the business of that particular locality. I now come to the various ways of raising money in the different localities for the purposes of a school clinic. In order to carry out its self-appointed task, the central committee has drawn to itself all those circles which possess any influence to further the scheme, namely, members of State and municipal authorities, members of Parliament, doctors, and particularly school doctors, dentists, teachers, and financial men of high standing.

The organ "Schulzahnpflege" (the Preservation of the Teeth) was also established, appearing at first monthly and now every second month.

A great number of lantern slides dealing with the care of the mouth and teeth have been made and are lent out for purposes of lecturing. The central committee has also, from time to time, had explanatory pamphlets sent to all authorities and also published in the press. It has also taken part in all hygiene exhibitions. It has also from its own funds, as far as possible, directly supported separate local efforts for the purpose of fitting up school dental clinics.

The means at the disposal of the central committee are, however, by no means large. They are composed as follows:

1. Grants from State funds.
2. Single grants from charitable donors.
3. Fees of members.

The balance sheet shows the state of finances for the third year:

	Marks.	Pfennings.	Marks.	Pfennings.	Marks.	Pfennings.
RECEIPTS.						
Proceeds of lecture Apr. 1, 1911			2,539	61		
Corporate members	1,782					
Other members	917					
Life members	200		2,899			
Single grants			6,621	65		
Local committee of Great Britain			194	50		
Other resources, including interest			625	75	12,875	51
EXPENDITURES.						
Salaries and clerical work	1,105					
Traveling expenses	183	50				
Printing and postage	2,052	35	3,340	85		
Grants for school clinics			600			
Investments			4,971	80	8,912	65
Balance					3,962	86

The 31st of May, 1912, then, shows a balance in hand of 3,962,86 marks.

One can see from this that the principal item of expense in extending our cause is that of printing.

If we now ask ourselves how it is that the central committee exercises such influence over towns of Germany which have self-government and which can determine to be completely independent over such institutions as school clinics, we can only attribute this circumstance mainly to the interest felt by the members of the central committee, who are either State or municipal officials.

It is owing to the initiative of Ministerial Director Kirchner that the decrees of the board of education are continually directing attention to the necessity of the care of the teeth during childhood, and we have him alone to thank for this.

The national schools of Prussia are really municipal undertakings, but at the same time are under the direction of the State, and are inspected by high State officials from time to time. On such visits of inspection, Mr. Henschen, of the board of education, has ever

drawn attention to the importance of the care of the teeth, and the interest thus shown has borne good fruit, for in the Dusseldorf district school clinics will have been opened in 15 towns by the 1st of April, whilst negotiations are in progress in the case of 8 others. The part the teacher plays in these efforts of the central committee is one of the greatest practical value. Explaining the importance of healthy teeth to the parents and children is only possible with the cooperation of the teacher, and this is attained by scientific lessons, or by making it understood in other ways by childen, or by holding lectures thereon for parents. When a school clinic has already been or is to be fitted up, then the teachers draw the attention of the children to it, and admonish them to make use of it.

The German central committee has the advantage of enjoying the cooperation of school doctors and dentists, and this advantage is by no means an inconsiderable one. One can therefore say with perfect justice that the care of the teeth in schools in Germany has made rapid strides during the last three years. We now have school clinics or institutions of a similar nature in almost 200 towns in which national school children can be treated.

The following questions are of the greatest importance for the carrying out of preservation of the teeth in schools in such a manner as was intended:

1. How will a school clinic best effect the purpose for which it was founded?
2. What will the cost be?
3. What ought such a clinic to accomplish in its work?

The fitting up of school dental clinics in Germany has been done in various ways, as follows:

1. The best and most successful way for a permanent school clinic is to have a municipal one, which is fitted up and maintained at the town's expense. The clinic is to a certain extent an institute belonging to the town itself, just as the schools and hospitals are. The treatment of children is undertaken free, or a small sum is given by parents able to do so. Such clinics are to be found in Strassburg, Charlottenburg, Wilmersdorf, Cologne, and Ulm.

2. The towns give only the rooms, or perhaps also fit them up, and then give a yearly grant, at the same time keeping the conduct of the clinic in their own hands. Funds are raised by making each school child pay a yearly sum of from 50 pfennigs up to 1 mark, the children thereby becoming subscribers to it. This system has been called the "Duisberg," because the town of Duisberg was the first to introduce it on a large scale. The parents are requested to give a sum of money for the health of their children before the fitting up of the clinic. Thus more than two-thirds of the children at Duis-

burg were gotten to pay a sum of 1 mark a year by the first appeal to the parents. Sufficient funds were obtained to guarantee the permanency of the clinic. Care was, however, taken that poor children should be treated absolutely free.

3. A committee is formed in the town whose business it is to see to the fitting up and conduct of the school clinic, and the town then provides suitable rooms and gives a yearly grant. In all other matters the committee is completely independent and has to bear the responsibility of raising the necessary funds for the maintenance of the clinics, regulates the appointment of the dentists, and the general conduct of the clinic. In Berlin, for example, a committee was appointed and the town authorities placed rooms for three school clinics at its disposal with heating and lighting quite free of cost, giving in addition a yearly grant of 25,000 marks.

The dental care of children is not limited to the great towns of Germany, but extends also to the country districts. There is, for example, a school dental clinic at Muncheberg, near Berlin, managed by Dr. Ravatt, which children from the villages around attend, often going two hours in a carriage to have their teeth examined and put in order. At Pilkallen (East Prussia) the following work was done last year (April, 1911–12): 157 extractions, 54 local deadenings of the nerve, 7 scaling the teeth, 55 treatments of roots, and 276 fillings.

The putting into practice of care of the teeth in schools differs very considerably from the care of the children by doctors.

There has for a long time been the institution in Germany of school doctors; these doctors do not treat the children, but only examine them and report as to the state of their health to the parents, who then must have them attended to. Besides this, the school doctors have considerable voice in all questions of hygiene in the school. One has never had much faith that this principle of examination and informing the parents would be of any use as regards the teeth, and, as has been proved, rightly so. For, firstly, the moneyless class have no means to pay for the care of their children's teeth; and, secondly, their education as to the necessity of care of the teeth is not so advanced amongst the lower strata of the people that the information as to the bad state of their children's teeth would produce much effect. As we have already seen, the usual system in German clinics is to have salaried dentists. There are, however, towns, such as Mannheim, for example, which have made an arrangement with local dentists to arrange for the treatment of school children in their private practice. This arrangement has, perhaps, some advantage for the resident dentists, but the German central committee has pronounced itself in favor of the founding of school clinics.

A pecuniary loss through school clinics by the local dentists is quite out of the question, for up to the present the children of the lower classes have never been under dental treatment. On the contrary, they will derive an advantage from them, for children who have been dentally treated during their school days will later find means of looking after and preserving their teeth. We have until now spoken of the treatment of school children, but we have also seen that in many cases the milk teeth in the sixth year are in such a bad condition that hardly many of them can be preserved. Now, the preservation of the milk teeth is of the greatest importance for the health of the teeth later on, and, further, milk teeth capable of mastication are of immense importance for nutrition, especially in childhood, so that the care of them also comes within the range of the efforts of the central committee.

In order to produce the necessary change, the care of the teeth must begin at an age before children are compelled to attend school, and for this purpose children in Strassburg, Berlin, and other places are dentally treated whilst they are in the kindergarten.

An attempt has been made to reckon out a sum per child for the cost of the school clinic, and Jessen has estimated that for 1 mark per child per year the treatment can be carried out. In Darmstadt last year 60 per cent of all the school children were treated, 5,777 in number, and the cost was 1.13 marks per child per year. One can then say that, generally speaking, treatment in the school clinic can be managed for from 1 to 2 marks per child per year. The services of the school clinic are not confined to the treatment of school children, but extend also to the teaching of parents with respect to the care of the teeth. Thus the school children are instructed by paid Sisters of Mercy in the use of toothbrushes and mouth washes.

On can form a pretty fair idea of the work of school clinics in Germany from the fact that in 1911, 22 clinics treated about 102,736 children.

When one considers that we have now about 200 such clinics in Germany, one is able to show a very happy result of progress in this field.

We welcome the spread of the care of the teeth in schools in Germany all the more because of its necessity as regards the care of the sick clubs for the working classes. Up to now the clubs have been obliged to spend large sums for the preservation of the teeth of their members on account of the teeth of adults being in such a bad condition. Now, the care of the clubs, to which the working classes in Germany must belong, forms a continuation of the care in school and even the poorest workman is in a position, through dental treatment, to obtain the benefits of modern hygiene in this field.

DENTAL HYGIENE FOR THE PUPILS OF PUBLIC SCHOOLS.

S. ADOLPHUS KNOPF, M. D., Professor of Medicine, Department of Phthisiotherapy of the Post-Graduate Medical School and Hospital, New York.

To ascertain the status of facilities for dental care with as much accuracy as possible, I sent a letter of inquiry to the superintendents of the 34 important general and special dispensaries of New York City. The four questions asked were as follows:

1. Does your dispensary have a dental department?
2. If so, how many dental surgeons are in attendance, and for how many hours per week and at what times are they engaged in giving their services?
3. Do the patients have to pay for the material for filling teeth, etc., or is it given gratuitously?
4. If there is no dental service attached to your dispensary would you be willing to establish one and arrange special hours for school children, so that the time for visiting the dispensary may not conflict with school hours?

To the 34 letters of inquiry I received 33 answers, which appear in full in this report. Many answers are highly instructive. The summary of them is as follows:

Letters of inquiry sent to dispensaries	34
Answers received	33
Have dental facilties	15
Have no dental facilities	18
Willing to establish dental departments	8
Unwilling or unable to establish one	9
Have asked for suggestions with a view to establishing one	2
Do only extracting	5
Do also filling	7
Do work gratuitously or charge those able to pay	8
Charge for material used	7
Have hours suitable for school children	7
Have hours unsuitable	6
Are willing to increase or change hours	2
Are unwilling or unable to change hours	2
Has 2 hours weekly, with 1 dentist	1
Has 12 hours weekly, with 20 dentists	1
Has 4 hours weekly, with 2 dentists	1
Has 6 hours weekly, with 5 dentists	1
Has 12 hours weekly, with 1 dentist	1
Has 4 hours weekly	1
Has 24 hours weekly, with 1 dentist	1
Has — weekly, with 1 dentist	1
Has 6 hours weekly, with 2 dentists	1
Has 18 hours weekly, with 16 dentists	1
Has 6 hours weekly, with 1 dentist	1
Has 12 hours weekly, with 2 dentists	1
Has 15 hours weekly, with 2 dentists	1
Has 3 hours weekly, with 3 dentists	1
Has 2 hours weekly	1

Answers to Questions I to IV and remarks.

Name.	Question I.	Question II.	Question III.	Question IV and remarks.
Amity Dispensary and Jones Memorial Clinic, 308–312 West Fifty-fourth Street.	Very fine dental department.	One dental surgeon; Tuesdays, 3 to 5 p. m.	10 cents for extracting, 25 cents for filling.	A desire to enlarge the clinic. We have demonstrated the great need of dental care of the teeth of school children, some coming from Harlem to us for treatment. But I hope the dentists will not take up this work unless they are paid a salary, or they will soon be in as bad a plight as the medical profession, who do so much in dispensaries and hospitals without compensation—saddling a burden which should be paid for by the public.—A. Ernest Gallant, M. D.
Bellevue and Allied Hospitals, out-patient department, Twenty-sixth Street and First Avenue.	Has dental department.	20 visiting dental surgeons; 2 to 4 p. m. daily, except Sundays.	No charges	Hours are already arranged, so as not to conflict with school hours.—Reported by George O'Hanlon, M. D., general medical superintendent.
Beth Israel Hospital, dispensary, Monroe, Jefferson, and Cherry Streets.	No dental department.			Plans are being considered for the enlargement of our dispensary, and when that is done a dental department will undoubtedly be added to the service.—Louis J. Frank, superintendent.
Cornell University Medical College, dispensary, First Avenue and Twenty-seventh Street.	do			For various reasons, we would prefer not to establish a dental department.—W. M. Polk, M. D., dean and director.
The Demilt Dispensary, Twenty-third Street, corner of Second Avenue.	do			I am afraid not, as the dental department we had has been discontinued.—T. J. Kearns.
Flower Hospital, out-patient department, 429 East Sixty-third Street.	do			We have given consideration in reference to establishing a dental department and will be very happy to receive any suggestions from you.—R. S. Copeland, M. D.
Fordham Hospital, dispensary, Crotona Avenue and Southern Boulevard.	Yes	Two dental surgeons; Thursday and Saturday afternoons.	Gratuitously	The dental clinic is used only for patients in the hospital and dispensary children who come for some other condition.—J. E. Nash.
German Hospital and Dispensary, Seventy-seventh Street and Park Avenue.	Yes	5 dental surgeons; daily from 1.30 to 2.30, except Sundays.	10 cents for those able to pay.	We can not arrange any other hours except those mentioned.—Louis Kortum, superintendent.
Good Samaritan Dispensary, 77 Essex Street.	Yes	1 dentist; daily from 12.15 to 2.15.	We do not fill teeth, only extract.	Question concerning change of hours referred to the board of trustees.—Paul S. Schultz, physician in chief.
Gouverneur Hospital Dispensary, Gouverneur Slip.	Have no dental department at present.			We anticipate having a dental department in the near future; no arrangements have been made as to hours.—Jessie A. Stovers, supervising nurse.
Harlem Dispensary, 108 East One hundred and twenty-eighth Street.	Yes	Mondays and Fridays, 1 to 3 p. m.	10 cents when able to pay; no filling.	I would have to hear what arrangements you can suggest before I can answer the inquiry.—A. Fergess, D. D. S.
J. Hood Wright Hospital Dispensary, One hundred and thirty-first Street and Amsterdam Avenue.	No dental department.			As our hospital is small and we have only emergency work, I doubt very much the advisability of taking on the dental work.—Lucy M. Moore, Superintendent.
Lebanon Hospital Dispensary, Cauldwell and Westchester Avenues near East One hundred and fiftieth Street.	Yes; about to open it.	1 chief, 1 to 5 p. m. daily	Nominal charge for material.	I will be very pleased to give you any more information you may wish after this clinic has been inaugurated.—Wm. Daub, Superintendent.

Answers to Questions I to IV and remarks—Continued.

Name.	Question I.	Question II.	Question III.	Question IV and remarks.
Mount Sinai Hospital Dispensary, Madison Avenue and One hundredth Street.	No dental department.			We are looking forward to the construction of some buildings in the not distant future and may then be able to increase the capacity of our dispensary and to include the dispensary organization departments which are now conspicuous by their absence.—H. Goldman.
New York Dispensary, 145 Worth Street.	Yes	1 surgeon; extracting only.		A repair clinic has been considered, but lack of funds has prevented the establishment; but I know it is the earnest desire of trustees to have one here. I will bring your circular note to the attention of the board.—Dr. Austin W. Hollis, Physician in Chief.
New York Hospital, outpatient department, 8 West Sixteenth Street.	No dental department.			One of our governors is interested in this subject, and I have taken the liberty of referring your letter to him.—Thomas Howell, M. D., Superintendent.
New York Post-Graduate Dispensary, Twentieth Street and Second Avenue.	do			Several of our teachers are asking that a Dental Department be considered after we get settled down in the new plant, and undoubtedly the institution would be pleased, then, to arrange hours for school children, etc., under such regulations as would be best for all concerned.—Frederick Brush, M. D., Medical Superintendent.
Northeastern Dispensary, 222 East Fifty-ninth Street.	Yes	2 dental surgeons, 3 to 4 daily.	Free	Not answered.
New York Nose, Throat, and Lung Hospital and Dispensary, 229 East Fifty-seventh Street.	Yes	16 surgeon dentists, 1 to 4 daily except Sundays.	Gratuitously	Do.
Northwestern Dispensary, Ninth Avenue and Thirty-sixth Street.	Yes	1 dental surgeon, 12 to 1 daily.	Only extracting, free.	Do.
German Poliklinik, 137 Second Avenue.	Yes	2 dental surgeons, 1 to 3 p. m. daily.	No filling done; other treatment free.	Changing hours would entail some loss of patients and likely greatly incommode our dentists. If the city would make some inducement for our dentists to fill teeth or to come at another hour, or both, we would be happy to do extra service for the good of the poor generally.—Thos. W. Busche, M. D., Chairman Executive Committee.
New York Polyclinic Dispensary, 214 East Thirty-fourth Street.	No dental department.			We are now planning the final details of our new building in West Fiftieth Street, which we hope to occupy within the next few months. We will not, at the present time, extend our field of activities. You can easily appreciate that all our resources are being concentrated for the accomplishment of our present undertaking.—John Gunn, Superintendent.
Presbyterian Hospital Dispensary, Madison Avenue and Seventieth Street.	do			We could not under present dispensary conditions. Lack of space forbids.
Roosevelt Hospital Dispensary, Fifty-ninth Street, near Tenth Avenue.	do			Not answered.

St. Bartholomew's Clinic, 215 East Forty-second Street.	Yes	2 surgeon dentists, 2 to 4 p. m., daily; Tuesday and Friday evenings, 7 to 8.30 p. m.	10 cents, if they can afford to pay.	Do.
St. Luke's Hospital, outpatient department, Amsterdam Avenue and One hundred and thirteenth Street.	No dental department.			Do.
St. Mark's Hospital Dispensary, 177–179 Second Avenue.	do			We should be glad to establish a dispensary for school children in the department, but unfortunately our dispensary service is already too large for our quarters. If later on we can secure more room, the question of establishing such an important service will receive our earnest attention.—Benj. J. Tilton, M. D., President.
St. Vincent's Hospital, outpatient department, 153 West Eleventh Street.	do			We are not prepared to undertake the expense attached to the opening of a new clinic such as you suggest. Regretting that our resources are not large enough to meet this desirable charity, I am, etc.—Sister Maria Isidon.
Trinity Dispensary, 209 Fulton Street	do			I am at a lost to see how suitable accommodation could be arranged for a dentist.—Bennett S. Beach, M. D., Physician in Charge.
New York University and Bellevue Hospital Dispensary, Twenty-sixth Street and First Avenue.	do			I desire to say that we do not have such a department and that it is not our intention or desire to attach to the dispensary such a service.—Egbert Le Fevre, M. D., Dean.
Vanderbilt Clinic, Sixtieth Street and Amsterdam Avenue.	Yes	3 surgeon dentists, Mondays, Wednesdays, and Fridays, 9.30 to 10.30 a. m.	A small charge	Not answered.—Chas. B. Grimshaw, Superintendent.
West Side German Dispensary, 328 West Forty-second Street.	Yes	Extracting only, Mondays and Fridays, 4.30 to 5 p. m.	Free; no accommodation for filling teeth.	Consult Dr. Homer Gibney.
Wilkes Dispensary (St. Mary's Free Hospital), 435 Ninth Avenue.	No dental department.			We could not arrange for a dental service under present conditions.—Sister Superior.
New York College of Dentistry, 205 East Twenty-third Street.		9 to 12 daily	Charges for material used.	We treat a large number of children every Saturday, as that day seems to be most convenient for them, and we are always glad to do everything possible for them.—E. B. Tripp, D. D.S., Chief.

A gratifying result of one of my letters of inquiry was an answer received, on April 15, from Dr. Thomas Howell, of the New York Hospital, to the effect that they had now established a dental clinic, which is in operation daily from 9.30 a. m. to 12 m. Tuesdays, Thursdays, and Saturdays. One dental surgeon is in attendance. The patients are not required to pay for the materials for filling teeth, etc.

To the report comprising 16 dispensaries, independent or attached to hospitals, we must add that there exist three dental clinics maintained by the Children's Aid Society. These are kept fully employed with the care of the teeth of the children attending the society's schools. Last but not least, there is one free dental clinic, being the health department's institution. On January 15, 1910, this first free dental clinic, exclusively for the school children of New York City, was opened at 440 East One hundred and twenty-first Street, as a result of the efforts of the Hon. Peter T. Barlow and a number of his friends. The entire amount of money needed to equip and maintain this clinic was contributed with the understanding that the department of health should detail a nurse to have general supervision over the children, and that only those children should be treated who attended the public schools and whose parents were too poor to pay for the treatment. Applicants are visited at their homes by the nurse, who investigates the financial status of the family and determines whether or not free treatment is justifiable. The nurse also assists the dentists during the treatment hours and keeps all cases under supervision, to see that the children return regularly for treatment, and that they are thoroughly instructed in the care of the mouth and teeth.

The clinic proper occupies two rooms, one being used for the patients who are waiting for examinations or treatment, and the other equipped with the necessary appliances, including two dental chairs. Two dentists are regularly employed, and they are both on duty every afternoon from Monday to Friday, inclusive, and on Saturday mornings.

During the first year of its existence this clinic treated 1,129 children. It gave 5,925 treatments, including 4,861 fillings, 1,499 extractions, and 469 cleanings. Each child treated had its teeth put in perfect condition before it was discharged. And what was the expenditure for rendering 1,129 children, at least as far as their dental condition is concerned, healthy, happy, and efficient? The total expenditure, including equipment, was $4,631.31. Deducting the cost of installation ($1,129.61), with slight depreciation of value, the average cost of complete dental treatment for each child was $3.10; including equipment, the average cost per capita was $4.10.

A little over two years ago I read, upon invitation, at the meeting of the dental hygienic conference and exhibit in New York, a little

paper entitled "The relation of modern dentistry to the tuberculosis problem." In it I ventured to state that if the condition in New York is typical of the school children in the whole United States, there must be in the schools of this country about 9,000,000 children with bad teeth. How many of these receive treatment? A very, very small percentage, indeed. And what is the result of this neglect of civic obligation of the community toward its children of to-day, the men and women of to-morrow?

In the paper above referred to I expressed the conviction, by which I am willing to stand to-day, that impaired digestion is often one of the first symptoms of tuberculosis, and that this impaired digestion is not infrequently due to a bad condition of the teeth. Ulcerated teeth may give entrance into the bones to tubercle bacilli accidentally inhaled or ingested, or as a result of secondary infection. Furthermore, it is almost impossible to cure tuberculous patients with no teeth or with bad teeth.

But it is not only tuberculosis which is influenced unfavorably or favorably according to the condition of the teeth; a general malnutrition, anemia, and chloro-anemia, malformation of the maxillary bones resulting from the loss of teeth, enlarged and suppurating cervical glands, and many other ailments, can be ascribed to the lack of dental care in childhood. To put it briefly, I would say that bad teeth, decayed teeth, or the loss of teeth during childhood, its concomitant discomfort, pain, depression of spirit, and lack of appetite, produce that physiological poverty which renders the delicate system of the child not only more prone to tuberculosis, to the invasion of the germs of serious, acute contagious diseases, such as measles, diphtheria, scarlet fever, etc., but also more susceptible to nervous afflictions, such as hysteria, chorea, and St. Vitus dance. It must be evident that the mental and physical efficiency of the future citizen is thus seriously impaired because of lack of proper dental hygiene and care in childhood.

To show the immediate results of the bad condition of the teeth in school children, I think I can not do better than to quote the following telling sentences from the very admirable report of the division of child hygiene under the direction of that efficient sanitarian and lover of children, Dr. S. Josephine Baker, of the health department of the city of New York:

> The practical results of this condition upon the school progress of the child is worth considering. There is a distinct loss of time in school, due to local pain and discomfort, and to the many diseases which find their starting point in the neglect of the mouth and teeth.
>
> Dr. Leonard Ayres, of the Russell Sage Foundation, has made a tabulation of the records of the physical examinations of 7,608 children who had been examined by the inspectors of the division of child hygiene. He found that children with defective teeth progressed 6 per cent more slowly in their school

grades than normal children, and that, whereas the average child with no defects completed eight grades in eight years, the average child with defective teeth took 8.5 years to complete the same course.

After a year's work, Dr. Baker reports:

Owing to the very wide prevalence of defective teeth among school children and the utter lack of facilities in the city for free dental treatment, the department has never been able to obtain proper treatment for these children who so urgently need it. * * * At present the department lays stress upon the necessity of the so-called toothbrush drills, which are given, especially to the younger children, by the nurses in the schools.

The following circular is given to the children:

DEPARTMENT OF HEALTH, THE CITY OF NEW YORK.

INSTRUCTIONS TO PARENTS REGARDING THE CARE OF THE MOUTH AND TEETH.

The physical examination of school children shows that in many instances the teeth are in a decayed and unhealthy condition.

Decayed teeth cause an unclean mouth. Toothache and disease of the gums may result.

Neglect of the first teeth is a frequent cause of decay of the second teeth.

If a child has decayed teeth, it can not properly chew its food. Improperly chewed food and an unclean mouth cause bad digestion, and consequently poor general health.

If a child is not in good health, it can not keep up with its studies in school. It is more likely to contract any contagious disease, and it has not the proper chance to grow into a robust, healthy adult.

If the child's teeth are decayed, it should be taken to a dentist at once.

The teeth should be brushed after each meal, using a toothbrush and tooth powder.

The following tooth powder is recommended: Two ounces of powdered precipitated chalk, one-half ounce of powdered castile soap, 1 dram powdered orris root; thoroughly mix.

This prescription can be filled by any druggist at a cost not to exceed 15 cents.

The child should take the toothbrush and powder to the school and receive instructions from the nurse as to their proper use.

Issued by order of the board of health.

In this very good circular, as well as in the admirable works of Drs. Baker and Ayres, I see, however, no mention of another feature of dental pathology which should appeal more especially to parents. I refer to the irregular teeth which are neither decayed nor otherwise defective, but merely cause a deformation or retarded development of the jaw, which are, however, as disastrous from a pathological point of view as they are deplorable from an esthetic point of view, particularly for young people. A poorly developed jaw may result in additional deformities of the nasal cavity and, of course, also prevent proper mastication. Thus, a deformed jaw is sure to produce

serious pathological conditions, involving the respiratory and digestive tracts.

Now, I know, of course, that the treatment of badly placed, deformed, or irregular teeth is a tedious and costly process. Orthodontia (the straightening of irregularities of the teeth) is a relatively new science, and because it takes from six months to a year, and often more, to correct dental deformities, it is at this time a matter which the health department could not undertake.

I would suggest that when the examining school physician or school dentist discovers a condition which can only be corrected by orthodontical treatment he should make the report to the parents, emphasizing not only the pathological but also the esthetic consequences of the noncorrection of irregular teeth. I believe there are but few parents who would not be willing to make all possible sacrifices to have such a condition corrected in time, particularly in young girls, and, for that matter, in boys as well. All parents are anxious to have good-looking children.

What a large field of usefulness and practical philanthropy does this not offer to righ or well-to-do lovers of children! Aside from the purely dental there should be, wherever needed, also special orthodontical clinics where the children of the poor and those of moderate means can receive gratuitously or very reasonably the care which now can only be bestowed upon the children of well-to-do parents.

It is gratifying to be able to note here that, thanks to the devotion and activity of Miss Theora Carter, the president and founder of the Good Cheer Society, an orthodontical clinic for the correction of dental deformities of poor children was established in Chicago last year. Miss Carter is at this time advocating a similar movement for "good teeth, clean teeth, and straight teeth," particularly intended for newsboys. Those interested in the work hope to see established ere long a general dental and orthodontical clinic in the Newsboys' Home of New York. Dr. George B. Palmer has already started the movement by giving talks to the newsboys on the hygiene of the teeth.

What can the members of this congress, and particularly those devoted to the hygiene of children, do to ameliorate the present deplorable and almost universal lack of general dental, including orthodontical, facilities for the care of children of the poor? They can make propaganda for this cause of childhood in governmental, medical, dental, and philanthropic circles. No science, no branch of medicine, has made greater strides than dental surgery. While the supremacy of general medical education may not yet be claimed for the United States, and, in fact, according to recent reports by Mr. Abraham Flexner, of the Carnegie Institute for the Advancement

of Teaching, does not compare at all favorably with Europe, American dental science has that singular distinction of being considered superior to European dental science. Every large European city has its American dentist and he has, as a rule, the élite of the European clientele. I know that European dentists are all eager for a post-graduate course in one of the leading dental colleges of the United States, and that one of their greatest ambitions is to add to their European degree that of an American doctor of dental surgery. They very well know the prestige such a title confers upon them. Would that the time may come, and come before long, when our general medical and surgical teaching institutions in this country will deserve the same prestige which our dental colleges now possess. However, our colleagues of dental surgery should also strive, as they have already done in some sections of this country, to make general dental hygiene a science familiar to the masses. Let them combine with philanthropists like Mr. Barlow and Miss Carter and with schools and health departments such as we have in the city of New York to prevent diseases and deformities in childhood by the multiplication of well-equipped and well-conducted dental dispensaries.

Bad and decayed teeth is a disease of the masses as much as tuberculosis, and as such it must be combated, and particularly in our children at school age. Just as we have societies for the prevention of tuberculosis, for the prevention of venereal diseases, and of alcoholism, representing the three great diseases of the masses, so should we have a society for the treatment and care of children afflicted with dental diseases. This society should be composed of all classes, medical and lay people, just as are the above-mentioned three societies. It would enable everyone who has the children's welfare at heart to contribute according to his means. The funds thus collected would materially aid to defray the expenses of taking care of the school children's teeth. Such a national society, having for its object the care of the teeth of the school children, exists already in Austria (Oesterreichische Gesellschaft fur Zahnpflege in den Schulen). This society is composed of high officials of the Empire, statesmen, pedagogues, physicians, teachers, and people of all sorts of professions and trades. The minimum dues are 2 kronen (about 50 cents), and teachers have to pay only half in order to enjoy membership. Sustaining members pay 50 kronen and founders 1,000 kronen. The Imperial Bank serves as treasurer.

In a recent appeal which this society issued we read the following telling sentences, which would show that our country is not the only one which suffers from this disease of the masses:

> There are 98 per cent of children with decayed teeth in Austria. Decayed teeth is a disease which might justly be called a disease of the masses; the seriousness of this affliction is, alas! not sufficiently recognized; the conse-

quences of decayed teeth are digestive disturbances, anemia, and general debility, all of which make the child, during its development, particularly susceptible to infectious diseases. Urgent help is needed. The child's oral cavity needs particular care during school age.

Happy are those children whose parents are able to provide them with dental care, but unfortunate indeed are the thousands of children of the poor who are deprived of this privilege. To help these unfortunate children the Austrian Society for Dental Care for School Children has been founded, and now makes a strong appeal for the establishment of dental school clinics.

I do not believe in pauperizing, and parents able to pay for dental care should be made to pay, but the poor should be treated gratuitously, and the money thus expended by the municipality or by private philanthropy will inevitably yield a return in efficiency and diminution of preventable diseases. And, last but not least, by such united efforts in improving deformities of the oral cavity, as well as pathological conditions, the esthetic sense will be awakened where it does not already exist. A good set of teeth is an ornament of which old and young are apt to be very proud. Let us have free and partly free dental clinics; let every child be examined and periodically reexamined for every possible physical and mental deficiency. Let no child pass through life with a pathological or esthetic defect which can be prevented by timely treatment and care. The result of such a provision will be better, healthier, and happier citizens. It is this care of the child of to-day, the man and woman of to-morrow, which must be forever our bugle call in the onward march of civilization.

THE HUMAN MOUTH IN ITS RELATION TO PUBLIC HEALTH.

W. G. Ebersole, M. D., D. D. S., Chairman of the Oral Hygiene Committee of the National Dental Association and Secretary-Treasurer of the National Mouth Hygiene Association, Cleveland, Ohio.

The mouth is the principal harbinger and most extensive breeding place for pathogenic microorganic life, and it is the path through which most of those organisms enter the human system.

In it grow and develop those microorganisms which produce dental caries—tooth decay—and dental caries is the most prevalent disease known to modern civilization. It takes courage to make a statement of that kind, when one knows that 90 per cent of his hearers believe that tuberculosis is entitled to the rank which we have given to dental caries. In making this statement I am aware that many of you are ready to take the floor in an attempt to refute this statement.

Within the past two years it has been demonstrated beyond any question that 96 to 98 per cent of the school children of this land are in need of care and treatment from a dental standpoint. In other words, 97 per cent of the mouths of the school children of this country

are in an insanitary or faulty condition. These mouths are not only diseased and filled with pathogenic microorganic life, but are unable to perform their normal function.

For years the health organizations throughout the world have been spending millions of dollars in their efforts to bring to the human family food, water, and air free from microorganic life which would produce pathogenic conditions within the consumer.

Much good has been accomplished, to be sure; but how much have we gained when we have brought food and drink to the consumer, at tremendous cost, and then, at the moment of their actual appropriation to the nourishing of mankind, to have them thoroughly mixed and incorporated with the very microorganisms which our millions have been spent to destroy or eliminate?

We willingly concede that much has been accomplished, but that which has been is infinitesimal as compared with that which might have been accomplished had a few of the millions spent in keeping foodstuffs free from pathogenic microorganic life been spent in giving to humanity food-grinding machinery, healthy and free from pathogenic microorganisms.

Of the 150 or more varieties of microorganisms which inhabit the human mouth many are of the kind for which millions have been spent in an endeavor to prevent their gaining entrance to the human body.

Some of these microorganisms are almost invariably present in the mouth and have been found to grow and develop with remarkable rapidity in this ideal breeding place. You know how the organisms which produce typhoid fever, scarlet fever, diphtheria, pneumonia, and tuberculosis are transferred from one individual to another; and you know the havoc these organisms are capable of. But the microorganisms which produce decay of the teeth are just as readily transferable from person to person and are working greater havoc than all the others put together.

In support of the statements just made let me quote Prof. Osler, who made the following statement before a body of dentists and dental students three years ago. He said:

> You have one gospel to preach and you have to preach it early and late, in season and out of season. It is the gospel of cleanliness of the mouth, cleanliness of the teeth, cleanliness of the throat. These three things must be your text throughout life. Oral hygiene—the hygiene of the mouth—there is not one single thing more important to the public in the whole range of hygiene than that.

Not only do the "tooth-destroying" microorganisms aid in producing breeding ground for other pathogenic microorganisms, but they produce two most favorable conditions for possible infection.

First, by their activities around the necks of the teeth, they produce softened and bleeding gums, which offer an excellent opportunity for infection. Second, by their inroads into the tooth substance, they destroy the dental tissue until the dental pulp is exposed, producing the best and perhaps the most frequent means of infection. A tooth with an exposed pulp, and especially one with a dead pulp, the pulp chamber of which is filled with pathogenic microorganisms, provides the best possible mechanism for infection, because, in chewing, the pulp chamber acts as the barrel of a syringe, and the foodstuffs are forced into the pulp chamber, as a piston, forcing the contents into the soft tissue at the apex of the tooth. The amount of infection which takes place in this way no man can estimate. But, when we consider the enormous number of mouths that have dental lesions, at least 50 per cent of them showing teeth which contain exposed or putrescent pulp, we may be able to explain many of the heretofore "not understood" sources of infection.

During the past three years, it has been my privilege three times to speak from the same platform with Dr. W. A. Evans, ex-commissioner of health of Chicago. The last time we were together he spoke on "The dentist and public health." He said:

> In the first place, the mouth is regarded now more and more as of relation to contagious diseases. About a month ago, I was at the meeting of the American Public Health Association, held in Milwaukee, and a great stress was there put on the relation of the secretions of the mouth, of the cavities accessory to the mouth, to scarlet fever, to diphtheria, and to measles, to which, with perfect propriety, can be added consumption, pneumonia, and common colds. In times past, in considering the care of the person who has had scarlet fever, we paid great attention to the skin. It is recently that we have come to understand that the skin is of minor importance in spreading scarlet fever, if of any importance at all, and that after cases had been held for the customary six weeks or thereabouts in the hospital, had been held until all scaling of the skin had ceased, and then had been returned to their homes, had been returned to the family circle in which there were children susceptible to scarlet fever, a certain percentage of cases would occur as a result of those contacts. Later we came to understand that the child supposed to be clear of contagion was, in reality, spreading contagion or carrying contagion back into that home, and then we came to know that the means by which contagion was carried was the secretion of the mouth and the accessory cavities of the ear, the nose, and the nasal pharynx, that contagion was held in the crypts of the tonsils, in recesses in the mucous membrane, in the secretions of the ear, and then we came to know the possibilities around teeth that had not been properly cleaned and in cavities filled with organic matter which might contain elements of contagion; and what is true of scarlet fever is probably still more true of diphtheria.
>
> The bacilli capable of infection lurk in the crypts of the tonsils, in the mucous membranes, around the roots of teeth, around the gum borders of teeth, in cavities in teeth; and, after these things have been proved, we are forced to confess that, in having allowed such children to go among the other children of a family, contagion has been carried to them through these means which were hitherto overlooked. Probably of greater consequence is the possibility of

the spread of contagion in the cases of pneumonia, common colds, and consumption. The work of the dental profession, the question of teeth cared for and teeth uncared for, is, therefore, a matter of great concern in the prevention of the spread of a contagious disease.

Thus far we have spoken of the mouth and the influence it wields for good or for evil from the hygienic standpoint.

In the medical profession we have specialists who devote their time and attention to every other part of the body, save the mouth. The medical men have sidestepped and left the mouth to the dental men. The medical men have considered the dental men oral specialists; and the dental men have until recently failed to grasp the full responsibility which rests upon them. Most dental men have been tooth specialists instead of mouth specialists. It is only when the dentist realizes his responsibility in the latter capacity that he assumes his true relation to the public health in his community. With oral conditions as we find them, and with the influences they exert upon the public health and general welfare of the human family fully recognized, and with the dental profession alone occupying the field of oral specialists, it to this profession that we must turn for the correction of the faulty conditions which here exist. To the dentist belongs the mission of teaching prevention, and the correction of dental lesions. In teaching prevention, he must do so from two standpoints. First, he must teach that "a clean tooth never decays," and must therefore instruct his patients in the performance of a correct dental toilet. He must also teach that "a lazy tooth becomes in time a rotten one." He must therefore teach when and how to properly use the teeth, that they may not only perform their full duty as related to the general digestive tract, but that they may, in turn, by their proper activity, aid in their own self-preservation. Last and least, it is his duty, when dental lesions occur, to correct or repair them.

Too often, with the dentist of the past, the last has been first and the first has been last; but to-day the many are awakening and giving full thought and consideration to prevention, while correction and repair is assuming its proper secondary position in the scale of importance.

I know of no better illustration of what an important part the mouth plays in the health of the individual than that which has been shown by Mr. Horace Fletcher, a man who at the age of 40 was a physical wreck, being "on the scrap heap," as he puts it. Denied insurance by the insurance companies and condemned to early death by the examining physicians, he has, by the proper use and care of the oral cavity, produced, from a physical wreck at the age of 40, a man who, at the age of 60, can practically double the feats of

strength and endurance performed by the athletes of the leading colleges of the world.

The chairmen of the oral hygiene committee of the National Dental Association for 1909–1912 undertook to prove the actual value of properly used and cared for mouths from the standpoint of working efficiency. In the summer of 1910 the 40 children having the worst oral conditions out of an enrollment of 846 pupils in Marion School, Cleveland, Ohio, were selected for the purpose of ascertaining the amount of improvement that might be brought about by correcting the faulty conditions and teaching the proper care and use of the mouth. In selecting these children complete and careful examinations of the mouths were made, and the history and class record of the children taken for six months before treatment began. Two sets of psychological tests were made at the beginning of our experiments to prove the actual working efficiency of the children at the time they were received for care and treatment. They were then given full and complete instruction on how to care for and use the mouth. A nurse took charge of them for the purpose of securing their cooperation, and dental service was furnished to correct all faulty oral conditions. The majority of these children were "repeaters," and many of them were only kept in the school by the activity of the truant officer. Two special meals were served to these children, for the purpose of teaching how to use their teeth properly, and, following the meal, they were instructed how to properly care for their mouths.

Of the 40 children selected, 5 were dropped the first day, because they would not agree to perform the duties which were required of them; and during the year's experiments 8 more were dropped because of failure upon their part to carry out the instructions given.

A remarkable showing was made as a result of these experiments. From the 1st of June, 1910, to the 1st of June, 1911, there was not a single case of illness of any member of the class. The school records, efficiency, attendance, conduct, and physical appearance and condition showed wonderful improvement, while, from a psychological standpoint, the mental tests showed an average improvement of 99.8 plus per cent.

Do not misunderstand this statement; we said that the psychological tests showed an average increase in mental working efficiency for the year of 99.8 plus per cent. We did not say that this increase was due to the correction of faulty conditions of the mouth—in other words, to filling and cleaning the teeth; nor did we say that this increase in working efficiency was all due to correcting faulty oral conditions and teaching the proper care and use of the mouth. A part of this improvement was due to the natural growth and de-

velopment of the children; but by far the greater part of the improvement was due to correction of the faulty oral conditions found, and to the proper care and use of the mouth. By "care" we mean cleanliness. By "use" we mean the selection of suitable foodstuffs and the proper manipulation of them while in the mouth.

If Horace Fletcher, by a thorough understanding and use of the oral cavity, could change a body that at the age of 40 was a physical wreck to one which, at the age of 60, could double the records of the athletes of that time, is it not reasonable to suppose that, in taking a class of 40 children having the worst oral conditions found among a thousand pupils, correcting faulty conditions and enforcing proper care and use of the mouth, such a percentage of improvement as we have shown here might have been obtained? The showing made by this class was startling indeed, and the greatest shock was felt by the dental profession, which for the first time received definite proof of the importance that the mouth bears to health, strength, and mental efficiency.

Every organization, National, State, or municipal, which has health for its concern, should have members of the dental profession not only in its council, but in its inspection department as well. Think not that there is no need for dental representation in connection with health boards or bureaus, nor that medical men can handle this important phase of hygiene.

The time is coming when medical men will wield sufficient influence to deal with faulty oral conditions, but not now, when the human mouth is the most neglected and ill-kept organ of the body. Medical and dental men must combine and cooperate if the greatest good is to come to the greatest number, and to come to the present generation.

In conclusion, let us call your attention to a few facts that have been long recognized but little understood. For years the physician, in diagnosis, has asked to see the tongue and the throat.

The coated tongue tells a story, but to the physician it is of things that lie beyond the tongue that it speaks, and not of the condition of the tongue itself. The coated tongue tells of lowered resistance and by its appearance may tell something more. But what makes this coating? Microorganic life that lowered vitality has permitted to multiply in great numbers, and the rough surface of the tongue is coated with them.

Kissing has been tabooed—except on stated occasions. The individual communion cup has been adopted, here and there, by the church. The public drinking cup has been forcibly discarded. Antispitting ordinances have been passed in all large cities. But what have we done for the individual whose faulty mouth is a serious handicap?

What the mouth means to the individual has been told in a measure by the experiments on the Marion school class. What has been done for the individual can be done for the public at large.

Let us understand the relations which the mouth bears to the health, and let us concentrate our efforts in teaching the proper care and use of the mouth: and let us do this in the interest of the health, strength, and beauty of the human family.

THE HYGIENE OF CHILDREN'S TEETH.

WILLIAM H. POTTER, D. M. D., Professor of Operative Dentistry, Harvard University.

The physical welfare of children is one of the most important problems of the present time. If the child is to be an effective working machine, each physical part must be in sound condition, and each function in good working order. Until comparatively recent times an incorrect emphasis has been placed upon the function of the teeth. Much stress has been laid upon the part which they play in forming an attractive facial expression and their importance in the production of spoken words. Comparatively little has been said in regard to the necessary part which they play in the preparation of food, so that it can be readily digested and thoroughly assimilated—a preparation of food which means the development and upbuilding of the body and its fortification against the attacks of disease. In order that we may clearly understand just what part the teeth should play in the treatment of food, it is necessary to rehearse briefly the physiology of mastication and digestion.

Foster, in speaking of the mechanism of digestion, says:

> The food, in passing along the alimentary canal, is subjected to the action of certain juices which are the products of the secretory activity of the epithelium cells of the alimentary mucous membrane itself, or of the glands which belong to it. These juices (saliva, gastric juice, bile, pancreatic juice, succus entericus, and the secretion of the large intestine) poured upon and mingling with the food produce in it such changes that, from being largely insoluble, it becomes largely soluble; or they otherwise modify it in such a way that the larger part of what is eaten passes into the blood, either directly, by means of the capillaries of the alimentary canal, or indirectly, by means of the lacteal system.

Now the process of digestion is begun when the central incisor teeth bite off a piece of food of such a size as can readily be accommodated in the mouth. Amongst uncivilized people this function of the central incisors is a very important one, as food comes to the individual in large chunks, not finely divided, as is common in civilization. When a morsel of food has been bitten off, it is carried back into the mouth and then begins the process called mastication.

The food is moved by means of the tongue and the muscles of the cheek to such a position that it can be crushed and ground by the closing of the teeth. This process is repeated many times until the food has the consistency of thick cream and has been thoroughly mixed with the saliva which is abundantly poured out from the salivary glands. An important digestive process begins in the mouth, namely, the conversion of starch into sugar. It is the duty of the saliva to bring about this change, and it can be efficiently made only when the food by thorough chewing is well mixed with saliva. Inasmuch as a large part of our food is composed of starch, the digestion which originates in the mouth is of great importance. When food has been thoroughly chewed and is fit for swallowing, it is passed by an almost involuntary motion into the esophagus, which leads it to the stomach. Here the food is acted upon by the gastric juices. If the food has been imperfectly treated in the mouth—that is, if it has been only slightly chewed and scantily mixed with the saliva—the change of starch into sugar is much delayed, and is imperfectly performed. But the thorough treatment of food in the mouth not alone helps in the digestion of starchy foods.

The proteids, to which class all meat foods belong, are best prepared for the action of the gastric juices of the stomach when well subdivided by the teeth. Moreover, it is a distinct advantage to all kinds of food that it be pulverized and made soft and mechanically unirritating before it is passed into the stomach. When mechanically irritating food is churned about in the stomach there is a real danger that its delicate lining membrane be injured in contact with rough particles of food. It is fair to infer that serious lesions of the stomach, like gastric ulcer, or even carcinoma, may result from this cause.

It can be said, then, of all kinds of food that when well chewed it is well fitted for the digestive processes which are necessary for assimilation, and that food that is not well chewed is not well digested and is imperfectly absorbed as nutrition.

There is, however, a more subtle but no less important way in which the teeth and their use enter into the problem of the physical welfare of the child. It can easily be demonstrated, by a self-imposed experiment, that when food is carefully and thoroughly treated in the mouth, the individual becomes very intelligent as to the kinds of food which can be best eaten, and the quantities of food necessary for the maintenance of the body. Thorough chewing and insalivation make simple foods more attractive and pleasant than complicate foods. A healthy instinct is developed which, without relying upon theories of what is best and not best to eat, naturally chooses the best, that is the best for the proper nutrition and development of the body. But this is not all. A slow and careful treatment of food in the mouth

develops an intelligent sense of the quantity of food which should be taken at a given time. The mouth in this respect is a safer guide than the stomach. The common method is for a child to eat until the stomach feels distended. When this has been accomplished the child is said to be "filled up" or to have his appetite satisfied. Distension of the stomach is a common sign that the intake of food should be stopped. If, however, the food is thoroughly chewed the mouth will judge far more intelligently than the stomach as to the proper quantity of food which should be taken. No distension of the stomach will occur, because the intelligent appetite will be satisfied long before the stomach can be overburdened. I dwell upon this point because I believe it is vitally related to the health and development of children. A large part of the disorders of childhood, disorders which interfere with the health, happiness, attendance at school, and general physical development, are produced by disorders of digestion; that is, the child has either eaten too much of a food which is healthful in proper quantities, or has eaten an unhealthful or unsuitable food. If the child can be taught to carefully and thoroughly chew its food, mistakes as to quality and quantity of food will be greatly reduced, and digestive disturbances, with their disabling results, will be proportionately diminished.

The thorough chewing of food not only serves as an important guide to the quantity and quality of food, but it induces a mental state exceedingly favorable to the proper flow of the digestive fluids and the regular motion of the digestive tract. This means better digestion of food, better absorption, less decomposition, less danger from the products of decomposition. Haste in chewing is accompanied usually by a nervous tension which means a scanty flow of digestive fluids and unsatisfactory muscular action of the digestive apparatus.

If the child is to have the physical benefits which come from a thorough digestion and assimilation of its food; if it is to acquire intelligence as to the kinds and quantity of food which are suitable for the development of the body, sound teeth, properly articulated, are absolutely essential. When I say sound teeth I do not necessarily mean teeth which have never decayed, for unfortunately there are only a few persons in any community who have not suffered to a greater or less extent from the destructive process of decay. I mean, however, teeth which have been kept in such repair that their original shape and contour have been maintained—teeth which can be used without the feeling of pain or the slightest disagreeable sensation. If such teeth are correctly articulated—that is, if the upper set meets the under set so as to form an effective crushing and grinding machine, then the child is able to get for itself the physical benefits heretofore described.

There is a third way in which the teeth affect the physical development of the child and that is by being, when diseased, a source of infection to adjacent and remote parts of the body. Decayed teeth, on account of their defective surfaces, not only make a thorough treatment of food in the mouth impossible, but they are the means of producing, developing, and nourishing that which is hostile to the child's physical welfare. In order to make this matter concrete, let us follow the course of caries in a child's sixth-year molar. This tooth is the largest and most important grinding tooth in the mouth. The carious cavity usually makes its appearance in the depression of the crown, just where food has been obliged to lodge after the eating of a meal. This cavity, at first very small, soon becomes large enough to be a constant abiding place for remnants of food, and the numerous bacteria with which all mouths abound. Whereas food deposit can to a considerable extent be removed from the natural surfaces of the teeth, it can not or is not likely to be removed from cavities of decay. Now these pockets of decay may harbor a number of sorts of serious bacteria which frequent the mouth, notably the bacteria of diphtheria, pneumonia, and of tuberculosis. If pockets of decay did not exist—that is, if the teeth presented unbroken contours—harmful bacteria could have a much less favorable resting place in the mouth. It would be possible to reduce their number to a minimum by the ordinary processes of cleansing.

Let us now follow our cavity of decay until it penetrates so deeply that it affects the soft parts occupying the interior of the tooth, parts which are abundantly supplied with nerve fibers. At this point, disabling pain occurs. The affected tooth is thrown out of service and in fact the whole set of teeth, upper and under, must cease to grind food, lest a stray morsel be forced into the cavity of decay, and severe pain be produced. The disabling pain, commonly called toothache, is, if of frequent occurrence and long duration, a serious hindrance to the child's physical development, in that it prevents the proper chewing of food, and depresses the physical force. If we follow the carious process in the sixth-year molar a little further, we shall find a death of the soft tissue inside the tooth, and its speedy decomposition.

When decomposed it becomes a violent irritant to its immediate environment and an inflammatory process is started up which, unless promptly treated, results in an abscess with a discharge of pus into the mouth. A frequent, and in some cases an almost constant, discharge of pus into the mouth is a condition often met with in the case of children. This pus may be a means of infecting adjacent parts, as the tonsils, or, by being swallowed with the saliva, may produce its harmful influence lower down in the course of the ali-

mentary canal. The relation between diseased teeth, adenoid growths, enlarged tonsils, and affections of the ear, is one which is being carefully studied at the present time. Just how diseased teeth affect the parts just named has not yet been fully worked out. In the view of some, a superficial infection occurs, originating from the pathological processes located in and about the teeth, and is carried by the act of swallowing to a location upon the tonsils, or to the entrance to the middle ear, or to the region of adenoid growths. Others believe that most of the infection is transmitted from the depths of the alveolar sockets, and absorbed by the tonsils and other parts from within. As relating to the connection between decayed teeth and enlarged tonsils and adenoids let me quote from the medical report of the town of Brookline, Mass., for the year ending January 31, 1908.

Dr. D. H. Walker, who has charge of the examination of the nose, ear, and throat in the public schools, says:

> I would like to call attention to the relation which I believe exists between carious teeth and glandular enlargement. The effect of the absorption of the products of decayed food and of carious bone upon the tonsils and glands in the immediate vicinity and on the digestive system must be far-reaching. I take the liberty of suggesting that a dentist be appointed to treat such children as can not be treated privately; that such dentist be located in the school building, thereby saving the time of the children.

Having thus discussed the relation of the teeth to the health and physical development of the child in three important particulars, namely, in making possible thorough assimilation and nutrition by means of thorough mastication; secondly, in assisting in a selection of food which is intelligent as regards quality, and more especially as regards quantity (this intelligence being developed in connection with a thorough use of the teeth in the process of mastication and being an important factor in the prevention of overeating, which is a frequent cause of disabling digestive disturbances in children); and thirdly, the important relation between diseased teeth, adenoid growths, enlarged tonsils, and affections of the ear, as well as parts more remote from the teeth, it remains for me to suggest some methods whereby the condition of the teeth of children can be placed on a higher level, and thus the child's general health and physical development be promoted.

The situation must be met, in the first place, by educational methods carried on in the public schools. Children must be taught the function of the teeth, their value in carrying out the digestive processes, and the great loss in efficiency and danger of infection, if they become diseased. This teaching should be extended, if possible, to the home, in order that the parents may supplement the teaching of the school. In Germany they hang upon the schoolroom walls

large charts upon which the cardinal facts about the value, use, and preservation of the teeth are displayed. These charts are of the greatest value in the education of the child, and I heartily recommend this form of instruction. An occasional illustrated lecture given in the school building, when scholars and their parents are present, does much to interest the child in the care of its mouth. In addition to these methods, I recommend the use of a small printed slip giving rules for the "Care and use of the teeth," such as I have devised for the schools of the town of Brookline, Mass.

This slip reads as follows:

DIRECTIONS FOR THE CARE AND USE OF THE TEETH.

1. The teeth should be thoroughly brushed after each meal.
2. A tooth powder used on the brush helps to clean the teeth.
3. Candy and crackers should not be eaten between meals; they cause the teeth to decay.
4. The slow and thorough chewing of hard food helps to preserve the teeth and to keep the mouth in a healthy condition.
5. Children's teeth should be examined by a dentist at least twice a year.

This slip, or one of similar import, should be pasted into the inner covering of at least one schoolbook belonging to each child in the primary and grammar schools. If this is done, it will be impossible for the children to grow up in ignorance of the laws of health which relate to the teeth, and it is probable that parents, too, will be much benefited by the printed advice. It ought to be said at this point that decay of the teeth, which is so universal and so hostile to the welfare of the mouth, is to a large extent a preventable disease, and for this reason I lay so much stress upon the educational measures. The cleaner teeth can be kept, the less likely they are to decay. The more thoroughly teeth are exercised by the use of hard foods, the more resistant they are to the forces hostile to them. Amongst uncivilized people there is little decay of the teeth. Decay comes with civilization, which brings soft foods; the excessive use of sugar and starch. To counteract the effects of civilization, we must teach children the thorough chewing of hard foods, which is Nature's way of cleaning the teeth, and we must also teach them the proper method of artificially cleaning the teeth by the use of a tooth brush and a suitable powder. If children will adopt these cleansing methods, decay of the teeth will be reduced to a small fraction of what it is to-day.

In connection with the educational work amongst school children, there must be operative work to stop processes of decay and to relieve pain. Here is the most difficult part of our problem. It is a hopeless task to-day to try to put in order all the teeth of all the school children in the average community. It is hopeless, because there are

so many cases of advanced decay. There are not dentists enough in any community to take care of all the public-school children's teeth, even if they devoted their entire time to this service. It is, however, not a hopeless task to treat all cases of incipient decay, and in this way prevent serious decay and obviate the difficulty of treating it. Such a plan has been put in operation in Cambridge, England, and has produced the best results. It was devised by Dr. George Cunningham, of that city. Treatment is begun with children from 6 to 8 years of age. Children of these ages will have only small defects in the sixth-year permanent molars, and probably no defects in other permanent teeth. The small defects are repaired, the children are taught to do their part in cleaning their teeth, so as to minimize decay. These children are inspected twice a year, and the necessary fillings made. The amount of time given to each child is small, because large defects are prevented. It is possible for each operator to treat a large number of patients. Children thus treated are to be kept under examination and treatment through the twelfth year, at which time all the permanent teeth will be in place, with the exception of the wisdom teeth. This system insures a complete set of teeth, with some small defects, which have been suitably filled. The child will also have been taught to take care of its teeth in such a way as to make serious decay unlikely in the future. Then, too, the years of greatest susceptibility to decay will have passed, and the child can safely be left to its own initiative as regards the care of its teeth. It will naturally be asked, What is to be done with school children who are now beyond the ages included in the treatment just described? In the mouths of such children we will find many teeth in a state of advanced decay. To restore such mouths to a normal and healthy state by operative work would take so much time that it is practically impossible. Effective work can only be done upon incipient cases; upon these our efforts should be concentrated. Advanced cases must necessarily be neglected: they will lose many teeth and suffer much pain. There is a certain analogy between incipient and advanced decay of the teeth and incipient and advanced tuberculosis. In the first class treatment is hopeful, in the second, discouraging. But something should be done for advanced cases of decay. Pain should be relieved; dilapidated and badly diseased teeth should be extracted. These operations can be quickly performed, and are a decided benefit to the child. In speaking of operative work for the school child, the question naturally arises, Who is to arrange for this work, and who is to pay for it?

My answer to this question is that if the teeth of school children are to be radically improved, if there are to be large proportions of children in our grammar schools who possess all their teeth without serious defects, then the city or town must establish dental clinics in

its school buildings and pay for their maintenance. I visited last summer in the town of Berndorf, Austria, a new school building of the grammar grade, in which four rooms were devoted to a dental clinic. These rooms had an efficient dental equipment; a dentist and a nurse were in attendance every morning during the school year, and the children of that school were not permitted to be physically and mentally handicapped by defective teeth. This is an ideal condition, and worthy of imitation everywhere. It is impracticable to send school children far from their schools or homes for dental treatment. In presenting a plan for the care of the teeth of school children I must allude to a bill which was last year before the Legislature of the State of Massachusetts, namely, a bill to create and legalize the "trained dental nurse." This bill allowed a nurse who was properly trained and who has passed an examination before the State board of dental examiners to examine teeth, to clean teeth, and to make applications for the relief of pain. If this bill, or a similar one, becomes a law it will give us trained helpers who will be of inestimable value in dealing with the problem of defective teeth of school children. One or more dental nurses attached to a school dental clinic could, under the supervision of a school dentist, examine all children, record their defects, clean their mouths thoroughly and often, attend to the teaching of dental hygiene, and thus greatly increase the efficiency of the work and reduce its cost. I have spoken of the necessity of preventing decay of the teeth. There is no one thing which will so effectively prevent decay of the teeth as to keep them clean. This cleaning the child must be taught to do, but, in addition, it is of great advantage if the child can have its teeth cleaned at short intervals by a trained operator. This the dental nurse could do, and thus prevent decay. The expense incurred in the care of the teeth of school children is to many municipalities an insurmountable obstacle. And it always will be, if registered dentists must do all the work in school dental clinics. We need the trained dental nurse to help prevent disease of the teeth, and to minimize the cost of treating what can not be prevented.

I do not wish to be understood as advocating that the municipality assume the cost of the care of all the children in the public schools. There are many children and, perhaps, the majority in the average school, who can afford to consult a private dentist. Such children should be examined at the school dental clinic, their defects noted, and their parents requested to have their mouths put in order. It will be the further duty of the school clinic to follow up these cases and see that the work is done. There are, however, a large number of cases in every public school whose mouths will never be touched,

except possibly for the extraction of teeth, unless this work can be done by a school dental clinic or a dental infirmary at a very slight expense or absolutely free. It is unwise to furnish dental services free except in cases of absolute need. If even a few cents are charged for a dental operation the child will appreciate it more on that account and its self-respect will be maintained.

It will, perhaps, be asked why in a city like Boston, which has seven or eight public dental infirmaries, the care of the teeth of school children can not be intrusted to these institutions. They can be relied upon to supplement the work of the school dental clinic. They can treat many of the cases of advanced dental decay which, according to my plan, can not be treated in the school clinic. They can not, however, be relied upon to make accurate examinations of entire schools, nor to institute educational work on dental hygiene, nor to insist upon early treatment of incipient cases. We can not expect them to give that systematic and scientific attention to the prevention of decay which is absolutely necessary if real progress is to be made in the renovation of the mouths of school children.

In conclusion, I would summarize my recommendations as follows:

1. Teach the child that decay of the teeth is to a considerable extent preventable, and instruct the child and its parents how to prevent it.

2. Establish in school buildings school dental clinics in charge of dentists paid by the municipality. Add the services of a dental nurse if the law makes this possible.

3. Begin work upon children before serious decay has occurred in their permanent teeth, and continue work upon these children through the twelfth year.

DISCUSSION.

Dr. Sidney J. Rauh, Cincinnati: While from 75 to 90 per cent of school children have defective mouths, the majority can be made hygienic through very short treatment and educational methods, more especially in the younger pupils. In an "Experimental dental class," conducted in Cincinnati, Ohio, the average was 85 per cent, as compared to 69 per cent in a "control class"; the appearance, attendance, conduct, etc., being relatively improved.

Dr. Bogue. In all the discussions that I have heard on oral hygiene, I have heard nothing about detecting and preventing nasal stenosis and facial deformity through operations on the temporary teeth of young children. The bony system is largely developed through the activity of muscles that are attached to the bones. The bones of the

face and jaws are no exception, but they also need the stimulus of proper mastication. The brain of the average child weighs, at birth, 371 grams; at 6 years of age, it weighs 1,360 grams; and at 19 years of age the brain weighs 1,400 grams, a gain of only 40 grams from the sixth to the nineteenth year of life, during which time the body makes its greatest effort of development.

All deformities therefore, whether of the hip joint, club foot, chin, jaws, teeth, nose, or face, should be corrected before the sixth year of life, for much can then be done practically without pain in a comparatively short time and with much greater certainty of success, because it is all accomplished during the years of most rapid growth and nature is aiding all the time instead of being an obstruction.

Dr. Lorenz refuses to replace a dislocated hip joint after 5 years of age, finding the surrounding parts too rigid and unyielding to insure success.

For precisely the same reason operations to prevent small nasal passages, crooked nasal partitions, irregular teeth, a high-arched roof of the mouth, a retreating chin, or a chin that projects like the jaw of a bulldog should all be undertaken and completed, if possible, before the sixth year of life.

Irregular teeth can often be brought into line at this early age by the use of a little curved wire arch no larger round than a pin or by other appliances.

This curved wire can also be made to spread the nasal passages and increase their size from before backward, thus obviating the necessity for breathing through the mouth.

By spreading the temporary teeth early enough in this manner, the crowns of the permanent teeth, which are held by the roots of the temporary teeth, are drawn into the positions which they ought to take. In this way very many irregularities may be prevented which would otherwise be inevitable, and the benefit of proper mastication from good occlusion (proper closing of teeth) will be of great importance.

Previous to 1900 little, if anything, was known as to the influence of the temporary teeth upon the permanent ones, and the most recently published works on orthodontia do not enlighten us on the subject.

Every mother should ask her family physician to recommend a dental surgeon who is competent to treat temporary teeth; he should carefully examine each child as soon as it reaches its third or fourth year to see if the teeth are healthy and the arches correct.

If they are not, he should be requested to make them so.

There are dentists who are qualified to do this and so prevent a deformity later on.

J. D., 4 YEARS OLD

J. D., 5 YEARS OLD.

W. S. G., 3½ YEARS OLD.

W. S. G., 4½ YEARS OLD

There are others who go so far in the wrong direction as to neglect the temporary teeth, seemingly not realizing that upon their good condition largely depends the position of the permanent teeth and the condition of the surrounding parts, and through them the health and beauty of the teeth, of the face, the efficiency of the breathing apparatus, and so of the whole body.

Some have even advised waiting until the permanent teeth are fully grown before undertaking their correction, thus confirming irregularities and deformities. It is the special function of the orthodontist to correct these defects.

There are two conditions which must call for the attention of an orthodontist at this early age (4 to 6 years), projection of the upper or lower teeth or failure of the temporary teeth to spread apart laterally, especially the six front teeth. At 4 years of age these teeth can generally be spread apart in from 15 to 90 days at small expenditure of time or money and without pain if the child has been well brought up and has not been frightened. After 5 years of age one can never be sure of results under two years, although the actual movement may have been made in two months. The teeth can be drawn into position after the patient has reached adult life, but they will never be very firm and the adjacent parts will never well adapt themselves to the new conditions if the period of growth is passed.

The longer one waits, the greater the expenditure of time, money, and possibly of pain, and the greater uncertainty of the teeth remaining in the positions into which they have been brought.

At 5 years of age, sometimes later, it is still possible to spread the crowns of the permanent teeth by spreading the temporary ones rapidly, but when the temporary teeth begin to fall out there is nothing to attach rapid spreading fixtures to but the permanent molars; besides, if the temporary front teeth are still in the mouth at 6½ or 7 years of age, that is an evidence that an arrest in the normal development has taken place, and it is generally best to resort to the ordinary methods of orthodontia.

Dr. Fred J. Mayer, of Louisiana: I am a delegate from the town of Opelousa, an Indian name, which, when the history of this movement is written, will bear the same relation to popular hygienic education that Chautauqua does to general education. Permit me to accentuate the statement of Dr. Ebersole, at least in so far as the Gulf States are concerned, that the percentage of dental caries far exceeds that of tubercular infection, and is doubtless the most prevalent disease known to civilization. The doctor, in reciting the infractions of oral sanitary law, referred to kissing, but seemed anxious to avoid going deeply into the subject, perhaps because it never fails to

excite the risibles of a lay audience, and yet it is difficult to conceive of a more senseless and dangerous practice, or "a custom more honor'd in the breach than in the observance."

Since the human mouth, from the bacteriologic point of view, is the filthiest and most dangerous cavity of the human body, as sanitarians we must condemn the custom, or at least commend the method of the French, who kiss on the cheeks or forehead, and why not of the South Sea Islanders who rub noses, as being less dangerous than the osculatory juncture of two protozoological gardens of microbian horrors.

Where streptococci grin in glee,
  Where microbes dig their holes,
Where germs feel free to split in three
  And exult in their septic souls;
Where still small sobs of spores endure,
  Where blue bacilli bore,
Where of cultures pure
A Washington sewer
  Could not provide any more.

The dental surgeon is to be congratulated on the fact that, like his medical confrère, he has awakened to a sense that his highest function is prevention and not cure.

What a thorny and dangerous path is painfully trod by the human race in its passage from the cradle to the grave! Made doubly dangerous by utter disregard of oral hygiene, the infant is scarcely an hour old when the consumptive mother, ignorant of the danger, kisses it; a little later the father, with alcohol and tobacco tainted breath, opes the portals of the charnel house and contributes his daily quota to the sum of its infection; the bachelor uncle, with lips barbed with the spirocheta pallida, fires his deadly shaft, and one by one the slobbering household and sympathetic neighborhood, innocently but none the less dangerously, implant the deadly product of dental caries, not to speak of specific infections, on the helpless infant, and not an arm raised in its defense; a little later, a consumptive wet nurse, or perhaps the innocent victim of syphilitic infection, administers the daily dose of milk, perhaps from a tuberculous cow, sipping the deadly draught through polluted lips, or cooling it with her fetid breath before administering. Is it a wonder that 50 per cent die in the first year of infancy? Then a little later, if the victim survives the ordeal, the poor waif of ignorance oscillates between mouth-infected pencils, "swapped" chewing gum, school dippers, and universal drinking cups, and even at the sacred altar is forced by custom to drink from the universal communion cup. The survivor, perhaps budding into a glorious womanhood, is then inducted into the mysteries of "Love's young dream," where the open sesame is the

polluted kiss laden to the gunnel with microbian infection too often of a specific character; of a verity, if it were not for the wonderful phagocytic resistance of the human organism to both hygienic invasion the whole race would perish from off the face of the earth before the age of discretion.

So let us bend every energy to the advancement of oral hygiene, and place upon our municipal, county, and State health boards a dental surgeon and sanitarian, and carry into the schools and to every hearthstone in the land that knowledge which, at least, will arm them to minimize the dangers.

66692—VOL 3, PT 1—13——25

FRIDAY MORNING, SEPTEMBER 27, 1912.

THE EDUCATION OF PARTLY PARALYZED MUSCLES.

EARL BARNES, Philadelphia, Pa.

The conclusions of this paper are based mainly upon eight years' experience with a little girl who when 18 months old was stricken with infantile paralysis. During these years I have consulted the best specialists in America and England in the fields of general neurology, massage, electrical treatment, mechanical appliances, and corrective exercises. I have also seen many other cases of infantile paralysis and have watched the development of some of them under different forms of treatment or neglect.

The paralysis to be considered in this paper is due to the destruction or impairment of some of the nerve cells in the anterior horns of the spinal cord. These cells under normal conditions send out the motor impulses which cause the muscles in different parts of the body to contract, producing action. Infantile paralysis directly affects neither the muscles nor the nerves. It simply demoralizes or destroys the battery lying behind them. Unlike rheumatism, it leaves the motor apparatus unimpaired, except in the nerve centers where the motor impulse originates. Since its victims are generally children, whose growth is still to be accomplished, the treatment following the acute period of disease, which rarely continues more than a week or two, is mainly educational, and belongs rather to the educational expert than to the physician.

In the case in which I have been specially interested, the child, a girl of 18 months, strong and healthy and walking freely, was so badly paralyzed that at first she was entirely helpless. She had even to learn once more how to creep, and only after some months was she able to stand supported by braces on both legs. From the first, however, there was steady improvement, and now after eight years she is taller and heavier than the average girl of her age and the trouble is confined almost entirely to the left leg below the knee. She walks miles without braces of any kind, swims, and rides a bicycle or a horse. In fact, she does anything which any active girl of 10 years would ordinarily do. The muscles drawing the left foot and toes downward are active, but the muscles that lift the left foot and toes have not recovered activity.

In this recovery mechanical appliances, braces, and supports have been freely used under the best orthopedic direction to be found in

America and England. Such supports, whether of rubber, leather, or metal, have two values. By supporting the weak muscles they enable the child to stand and move about, thus adding greatly to its health and happiness. They also insure the weaker muscles and tendons against overstrain, and thus prevent deformities which it would be very difficult to correct in muscles where control and nutrition were already weakened.

On the other hand, mechanical appliances always interfere in some degree with circulation, and thus increase the probabilities of atrophy. They also make it possible, through the new leverages they establish, for the child to act without calling all the muscles into use. If a foot can be put where one wants it, without using the muscles of the foot, even the partial work they might do is left undone, and, with disuse, power is not recovered, and even what exists may be lost. In the education of impaired muscular control mechanical appliances are often indispensable, but they are at best a necessary evil.

In the treatment of these cases frequent and sustained massage is always necessary. In the case under consideration impaired muscles were massaged every two hours of waking time during the first year, and daily since, with brief exceptions during holidays or travel. The massage, by exercising the tissues, increases the blood supply and works out the broken down matter. By strengthening the blood supply and aiding nutrition it prevents atrophy and all the consequent disorders that accompany the shortening of any members.

However, it must be remembered that the initial difficulty does not lie in the muscles, but in the nerve cells in the anterior horns of the spinal cord. There is doubtless some reaction in these nerve cells through massage, as will be explained later, but the principal values of massage are in keeping up the general health and in keeping the joints free and the bony levers and their muscular attachments in good order, so that if activity of the nerve cells is restored the machinery for action may be ready for use. Massage can also keep unused muscles stretched, and thus prevent deformity.

The effects of electricity on muscular activity are still too uncertain for a layman to pass any judgment upon the matter. I have tried both galvanic and feradic currents, but with uncertain results.

So far we have discussed the means of keeping the muscles in good condition, but how are we to reach the nerve cells in the anterior horns of the spinal cord? Some restoration of function will come steadily with renewed health and the natural processes of growth, but specially devised exercises will certainly accentuate and increase this restoration. This is the point where definite education comes in.

All of Dr. Edward Seguin's work with the feeble-minded rested on the belief that even passive exercises tended to strengthen the

nerve centers, and his ideas are now used in the treatment of the feeble-minded everywhere. Thus to make an imbecile think, he exercised the arms and legs and other parts of the body along lines established through coordinated action in the human system by many generations of ancestors for useful purposes. The teaching of Dr. Montessori implies this same belief in the value of organized activity in strengthening nerve centers, though she does not state it so clearly as does Dr. Seguin.

Our present knowledge of the nervous system enables us to understand how action may strengthen the nervous system. An efferent current is sent out to a muscle from a motor center only when that center is aroused by an impulse coming from a sensory center or from an ideational center in the cerebrum. Now, opposite the anterior horns of the spinal cord, are posterior horns of sensory nerves, into which sensations are poured from all parts of the body. These sensory cells of the posterior horns have three connections. They are connected directly with the motor nerve cells in the anterior horns, with the cerebellum, and with the cerebrum.

Let us imagine, then, what must happen if we tickle a child's foot. The sensations will be carried in along an afferent nerve to the sensory nerve cells in the posterior horns of the spinal cord. The impulse will then undergo some change, not well understood, and will pass on as an impulse to the impaired motor cells of the anterior horns, to the cerebellum, and to the cerebrum. If the child be passive, or even asleep, the impulse will pass out of the anterior motor cells to the muscles of the foot, and it will be withdrawn from the tickling finger. If the child is awake and attentive, the outgoing impulse will be strengthened from the cerebrum center, and the foot will be still more vigorously drawn up.

If stimulation and exercise mean growth and health, as we believe they do, then all these centers must be improved if they are normal, or merely impaired. Thus all massage, by exciting a multitude of sensations that flow into the posterior horns and pass into the motor centers in the anterior horns, to the cerebellum, and to the cerebrum, must strengthen all these centers, even if the massage is received in a purely passive state.

But in exercises the child's attention and will can be brought into play, so that the returning body of sensation excited by the action must be vastly more effective than when the child is passive. Further, if these exercises are so planned as to correspond with the habits of the race, which by long repetition have become almost or quite instinctive, our training will be doubly effective, because it will move along lines of least resistance. Walking, talking, handling are types of such actions.

Thus, if the muscles of the legs are affected, we can put the child on a tricycle and tie his feet to the pedals. If he is then pushed about, the thousands of sensations excited in connection with a movement of the legs habitual to the race will pour back to the posterior horns of the spinal cord and pass on to the impaired motor cells of the anterior horns, tending to strengthen them. They will also pass to the cerebellum and the cerebrum, from which they may come back as voluntary effort, still further strengthening the impaired cells. Walking, swimming, and horseback riding will broaden and strengthen the general training of the impaired centers.

But the nerve cells of the motor centers, if not entirely destroyed, undergo different degrees of impairment. Some are capable of very slight response, while others may remain nearly normal. Here the specialist, intimately acquainted with anatomy, must come in to direct special exercises. If the right foot turns outward, exercises must be devised that will make the foot turn in. Understanding the game, but not necessarily the purpose, the child will concentrate his attention and his will upon it. Such effort as he can make he will put forth, and the sensations awakened by the effort will travel back and ultimately produce an effect upon the impaired centers which should control that action.

It is obvious that the cooperation of the patient is of the greatest possible value. Hence the educator must call to his aid every possible device that will interest the child. Approval, praise, rewards, imitation, contest, a sense of steady advance will make the child his own best aid in working through the otherwise dreary repetitions that lie on the road to recovery.

Meantime, with skillful direction and unfailing courage, the restoration of function may go on for years. I have seen constant unremitting effort fail to produce any visible results for a year, and yet eventually lead to almost complete restoration.

TRAINING OF MIDWIVES IN RELATION TO THE PREVENTION OF INFANT MORTALITY.

Miss Clara D. Noyes, New York City.

Before proceeding with the paper which I have been asked to present, I wish to offer an apology to the audience for being here. Miss Carolyn van Blarcom, executive secretary of the committee on prevention of blindness of the New York Association for the Blind, was expected to present this subject, but prolonged illness has prevented her from doing so.

The many cases of preventable blindness directly traceable to the carelessness and ignorance of untaught midwives seemed of such vital importance to unborn babies that this committee widened the purpose for which it was originally formed, and, with the aid of the Russell Sage Foundation, has been making a careful study of the midwife both here and abroad.

Prior to the passage of the act which provided for the control of midwives conditions in England were strongly analogous to those now existing in America. This committee was greatly impressed by the simplicity and practicability of the English law, and by the fact that, instead of replacing obstetrical practice by the work of trained midwives it has increased the work of medical obstetricians.

The midwifery section of the American Association for the Study and Prevention of Infant Mortality, at a meeting held in Chicago in 1911, spent considerable time in the consideration of the midwife and midwifery problem in America. In summing up the findings of this section we note that further study of the midwifery problem was suggested "before recommending any policy as to abolition or the recognition or supervision of the midwife." This apparently negative attitude appeared to leave the matter where it has drifted about in the past. Fifty years ago the Medical Society of New York County voted almost unanimously against licensing the midwife. From time to time since then, and quite generally throughout the United States, attempts have been made toward control and restriction, even abolition, of this class of workers. Laws to this end have been framed and passed, but in no place do they seem to have been effectively or systematically enforced, as the midwife is found plying her trade throughout the length and breadth of the land. Every sickly, ill-nourished infant, every babe brought into milk stations, dispensaries, or hospitals, with infected eyes or preventable deformity, for which a midwife is responsible, adds fresh evidence against our apparent indifference and blindness to existing conditions. Granting that the midwife problem is of too long standing to be settled hurriedly, and warmly advocating the most careful and thoughtful study of the ways and means toward the solution of this problem, nevertheless, it would seem that the most ardent advocate of the abolition of the midwife could hardly bring an accusation of undue haste against those who have been brought to believe that society calls for her continuance and suitable education.

The history of the midwife is the history of the human race. Out from the dim obscurity of countless ages she makes her appearance, officiating at the birth of the mighty. She dared assert herself even against kings. When Pharoah issued the order to the midwives saying, "Every male son that is born ye shall cast into the river," Puah and Shiprah defied him and outwitted him. If they had not,

Moses, who, afterwards became the great Hebrew leader, would not have been saved to lead his race to the Promised Land.

It would take too long to trace the history of the midwife down to modern times, when we find her, in America at least, pushed into the background by the medical profession, and with few exceptions belonging to a conspicuously ignorant and untaught class, totally unfit to discharge the duties they are constantly called upon to perform.

Deplorable as this may be, in justice to the midwife, we find from all reports that midwives are responsible for less injury to mothers and children than that laid to the door of the medical profession. Dr. Williams says: "It appears that the majority of teachers in this country consider that general practitioners lose as many, and possibly more, women from puerperal sepsis than do midwives." The same seems to be true regarding preventable blindness and deformities; to quote again from Dr. Williams: "This is a terrible indictment against the medical profession." Yet we find in a recent editorial in the Boston Medical and Surgical Journal the midwife thus described:

> The midwife may be defined as a person attempting to practice obstetrics without complete or even adequate medical education. The tolerance of such persons is an anomaly in an enlightened civilization. The midwife is a relic of medievalism, unhappily, extant in the Old World, but whose persistance in our own community should not be encouraged by any form of recognition.

Nevertheless, even in America they are attending approximately 50 per cent of all births. In New York City alone 50,000 annually. Even in the shadow of the "gilded dome," where the laws of Massachusetts are made forbidding them to practice, they are recognized and birth certificates having their signatures are accepted.

It is true that we have very inadequate statistics from which to form our conclusions, yet we have sufficient to know that failure to recognize the existence of the midwife or to ignore her existence amounts to little short of criminal negligence.

Dr. Baker, of the child hygiene bureau of the New York City Department of Health, reports that out of 33 States from which she has gathered statistics only 13 could show that the practice of midwives is defined by law. Six of these know the number practicing, and only 4 could state the number of births reported by them. No one knows, apparently, how many are practicing. In New York City, in 1911, there were 1,344 permits in force, but district nurses, social workers, and physicians feel confident that probably as many more are practicing without permits.

The Old World has faced the problem with greater honesty and has provided adequate instruction for the midwives with laws for regulation and supervision. Excellent schools, with courses varying in length from six months to two years, exist very generally in these countries, the laws of England and Denmark being particularly fine

and conspicuous for the class of women who enter the field. In Denmark midwives practically control the practice of midwifery, and we find a remarkably low infant and maternal death rate.

"The value of trained midwives," to quote from Miss van Blarcom, "is already apparent in England, where 12 years ago conditions were strongly analogous to those in America at the present time. It is believed by English workers that the better obstetrical work being done by English midwives as a result of their better training and better control must be reckoned as one of the important factors in the decreased death rate among infants and mothers, the percentage having dropped from 151 deaths among infants per 1,000 during 1901 to 106 per 1,000 in 1910." A corresponding maternal decrease in deaths from puerperal sepsis and accidents of childbirth is also reported.

Contrast this with the state of affairs existing in America, 50 per cent of our future citizens being attended at birth by a class of workers for whom we have provided no special opportunity for education. In the face of a social condition which is bound to sustain the midwife, can we at present, or for many years to come, abolish them, even if found possible under the American Constitution? Assuming that we can not abolish them, then we must, in all honesty, recognize them, provide for their education, their regulation, and subsequent supervision.

The question has been and will be raised as to the wisdom of providing for the education of a third class of workers when physicians and nurses are already in the field. It must be remembered that midwives also are already in the field, and, for economic reasons, seem destined—at least for the present—to remain. Therefore under the circumstances education seems only logical.

Better-trained physicians, extension of free obstetrical clinics and obstetrical hospitals, education of the laity, and further development of visiting obstetrical nurses are some of the recommended substitutes. It would take years to accomplish these reforms. Even, then, will they replace the midwife? If not the midwife, who? Will highly trained obstetricians practice on the East Side of New York or in the rural districts? Will the foreign-born woman, with all the inherited prejudices of generations against the "man-midwife" and a family of children clinging to her skirts, enter in any numbers the obstetrical hospital or take advantage of the free obstetrical clinic? Even if she were willing, her husband would probably rise up and prevent her from doing so. Education, excellent as it may be, is discouraging, for every ship brings hundreds who possess the same traditions and prejudices against hospitals and the man-midwife, while conditions remain the same in the rural districts, where the

mothers and babies of the poorer classes are subject to unparalleled neglect and suffering. Desirable as hospital care may appear to be for the poorer classes, from such statistics as I have been able to collect we find, even in a great city like New York, with its millions of inhabitants, approximately 1,000 beds for obstetrical patients, and although at times these are filled, there are many times when these beds are not filled. There seems to be little pressure, generally speaking, for more obstetrical beds. Every teacher of obstetrics, both physicians and nurses, will acknowledge, I am sure, the uphill work encountered in establishing an active obstetrical service for medical students and pupil nurses in general hospitals. Out-patient services seem to be upon the whole more popular with the poorer classes.

The midwife may be gradually replaced by the combined force of these substitutes, but in the meantime here she is, and has been for ages, and here she apparently expects to remain.

It is important that the difference between a midwife and obstetrician should be clearly understood by all. A midwife should never officiate at other than absolutely normal cases, but in order to be able to distinguish between normal and abnormal she must of course have careful practical teaching. Neither would we wish to appear to be underrating the value of obstetrical hospitals, free clinics, and district obstetrical work in the community. They are of inestimable value, not only to the public, but they play an important part in the general educational scheme of physicians and nurses.

If we would guard at the foundation the strength of the nation we will no longer ignore the existence of the midwife and the part she plays in the social structure. All leading authorities in the question of infant mortality agree that the prenatal care of mothers, instruction to mothers in infant and personal hygiene, adequate obstetrical care and breast feeding, are all essential factors toward a lowered death rate among infants. With characteristic waste of our natural resources, approximately one-half of our child life is under control before, during, and after birth by a class of workers who have not been taught themselves, and who are therefore not prepared to give this fundamental teaching.

We must not condemn the midwife too harshly for her lack of training, for we again and again find her, without compulsion, making an effort to secure teaching and availing herself of such opportunities as present themselves, only to find that, after spending money and time, she has been exploited, and the few lectures she has heard and the pretentious diploma which she has received are of little practical value. In a country without standards, with inadequate or no laws for regulation and supervision it would be preposterous to expect the

midwife to be other than she is. Even the well-trained foreign midwife, as the stimulus of supervision is removed, lapses and becomes careless.

The arguments which have so far been advanced against the training of midwives do not seem to those who believe in her education to be particularly sound ones. One eminent authority says in speaking of a lowered maternal death rate: "It is not by educating the midwife to do better work, because we have seen that the mortality in the midwife's practice is not as great as in that in the hands of the medical practitioner." We can not feel that this criticism of the work of the physician is any reason why we should discontinue the struggle for better medical education. If the midwife does better work untrained than the general practitioner, what type of work would she do after six months or one year of careful training?

It is also contended that the type of woman who would apply as candidates for training would be of such a low order that it would be a waste of effort, since, when trained, they would gradually slip back into careless or ignorant ways. That would be almost certain to occur unless laws were made for control and careful supervision, such as we find in England, under the central midwives' board. Education means elevation and progress. It has not been a very long time since doctors were barbers and not long since the nursing care of the sick was rescued from degradation by Florence Nightingale. A very high type of woman enters the field of midwifery in England. Many nurses superimpose this course upon their general training and, under the direction of visiting nurse associations and charitable organizations, work among the less highly favored classes in the large cities and through the country districts as Queen's nurses. It has also been proven beyond question that trained midwives, instead of invading the province of physicians, as some members of the profession have feared, the activity of trained midwives has actually resulted in greater demands upon the services of medical obstetricians. The more highly trained and educated the midwife, the less willing will she be to assume responsibilities which are not hers, the more quickly will she recognize them and the greater discrimination will she show in the type of physician she calls to her assistance. There seems to be no fundamental reason why the technically educated midwife should be feared any more than the technically educated physician or nurse. Any institution or profession, whether the law, medicine, or nursing, acknowledges an inherent weakness when present position or temporary success is considered before the great human cause lying in the background. It is not unreasonable to expect that advanced obstetrical training will eventually be given to nurses in this country to fit them to carry their share in this problem of mothers and babies. A prophetic note was struck

at the Chicago meeting last year by the section on nursing and social work, when a resolution to this effect was offered, but was finally held over for further discussion.

If the midwife can be gradually replaced by the nurse who has superimposed upon her general training a course in practical midwifery which has been clearly defined by obstetricians, it would seem a logical economic solution of the problem, for we should not only save the expense of training another class of workers, but we should be able to provide better teachers, better nursing, and eventually better medical assistance to the less highly favored classes.

The practical difficulties to be met in providing education for midwives are not inconsiderable. The requisites are material and money. Our State and National Governments provide for the education of every known class from the feeble-minded to those desiring a scientific education. Why not for midwives? The school for midwives which was organized at Bellevue Hospital in July, 1911, is supported by the city of New York. It is the first of its kind in America and has demonstrated that midwives can be taught, and, moreover, that so far they have proved acceptable to the community.

Dr. John W. Brannan, president of the board of trustees, inspired by the investigations that were being made by the committee on prevention of blindness, quickly advocated the training of midwives, and this little school, important as the entering wedge, was the immediate result.

In little more than a year the beds in this hospital have been increased from 8 to 20 and the work in the out-patient field steadily growing, while the individual experience shows that where the first midwife, finishing a six months' course, observed 60 cases and delivered 8, the last one finishing observed 104 and delivered 12. In this school particular emphasis is placed upon the prenatal care of the mother and her surroundings, the nursing care of mother and baby, and the importance of breast feeding. The pupil midwives are required to do all the housework, thus acquiring a fundamental training in cleanliness, cooking, sanitation, and hygiene.

Dr. Jacobi in his masterly address to the American Medical Association in June, 1912, placed the stamp of his approval upon this venture and advocated in no uncertain terms the wisdom of providing suitable education for the midwife.

Admirable as any provision for education may be, it will be a loss of effort without regulation and systematic supervision.

Education and legislation will surely mean the gradual elimination of the old familiar type of midwife. I venture to prophesy, although I may be wrong, that it will not be long before we see our cities and larger towns districted and covered by trained and certified midwives working under the visiting nurse or charitable organizations, with

the same organization extending into the rural and mining districts. In the rural districts of the South I see a distinct place for the certificated colored nurse, who now has considerable difficulty in securing nursing work. This work may even be under State or National control. Would it not be a wise economy and therefore a national asset as long as babies must be born and will be born that they are born as healthy as possible? I would not have you misunderstand me. Even the most optimistic would not expect, by the simple process of training midwives, to secure perfectly sound and healthy babies, but investigation has shown that she is an important instrument and that we can no longer tolerate existing conditions. Our spirit of citizenship is at last stirred, the pitiful cry of the neglected infant has at last touched our hearts, and it is for this reason that we urge the education of women, whether as the midwife pure and simple, or as a further development of the nurses' work in the practice of normal midwifery, not as a means of livelihood, "although every laborer (even a midwife) is worthy of his hire," but fundamentally as a protection to the strength and health and wealth of the Nation.

PHASES IN THE DEVELOPMENT OF THE INFANT WELFARE MOVEMENT IN ENGLAND.

Dr. JANET LANE-CLAYPON, King's College for Women, University of London, England.

Thirty years ago the movement to prevent infant mortality was commenced in France; the greatest developments belong, however, to a much more recent date and are in Europe, at any rate for the most part, products of the last decade. Those of us who have been privileged not only to take part in the movement but also to have the opportunity of personally following the phases of development in the various countries have seen gradually unfolding before us what, I think, may fitly be described as a vast scientific experiment.

The object of this research was the means of prevention of the death of infants. The research is not yet completed, but the data so far available are such as to justify a review of the results obtained at the present time and of the work which is still in progress.

During the last few years, in which I have had the opportunity of studying the methods used in those countries of the Continent of Europe which are most actively engaged in this work, it has seemed to me that we in England have provided a peculiarly fitting ground for the gaining of experience in this work of infant welfare. We have unwittingly supplied the control cases for the great experiment, as far as it at present stands.

I need hardly mention that the real beginning of the movement was made by the establishment of the first infant consultation (consultation des nourissons) by Prof. Budin; this consultation had no milk depot attached, but sterilized milk was supplied to the few cases where breast feeding was found to be impossible. This led, however, to the founding of the "goutte de lait," or, as we know it, the milk depot. These institutions caught the public attention and spread with great rapidity even into remote parts. I should like, however, to emphasize the fact that initially there was no such institution as a milk depot alone, but an infant consultation, presided over by a physician, was always carried on in connection with the depot, to which infants receiving the depot milk were required to be brought at stated intervals.

England, alone, of all the European countries, has seen the establishment of milk depots without any medical supervision of the infants receiving the depot milk. I should mention that in a few cases the medical officer of health gave some degree of supervision to the infants.

In England we have, therefore, been the means of demonstrating the advantages and disadvantages, respectively, of the two institutions originally found together in the "goutte de lait," namely, the infant consultation and the milk depot.

As a whole, it may be said that the star of the milk depot never rose far above the horizon in England, and is now waning. All the milk depots have been municipal undertakings, the expense being borne by the towns, except that at Finsbury, which was started as a voluntary effort, and York had a depot for about two years which was also supported by voluntary contributions. Out of the 11 depots started in England, 2 have been closed, 1 (Leicester) is no longer a milk depot in the usual meaning of the term, and several others have been on the point of closing down for some years past. The causes for this are many and varied, but there are certain predominating points, which are common to all the towns. In the first place, the expense involved is very heavy, varying roughly from just under to just over £1 ($5) per head per child on the books. This expense is incurred on behalf of a comparatively small number of infants, since it touches, in the first place, only the artificially fed infants, and further, only a relatively small percentage of these. The number of breast-fed infants is, generally speaking, fairly high in England; the available data are scanty, but it appears to vary considerably in the different localities, depending upon the occupation of the mothers.

In St. Helens, where the first milk depot was started, a record has been kept for several years, and it appears that in 1910, 98 per cent of all the infants born were breast fed, and only 6.6 per cent were

weaned under 6 months of age. The figure for this town seems to remain at about this level. In Finsbury, which was the first borough to close down its milk depot, in 1909, 90 per cent of the infants were breast fed up to 3 months of age, either entirely or partly, and a very considerable number were so fed for longer periods. The remaining number of infants available for the milk depot was therefore comparatively small.

In almost all the towns it was found that the death rate among the infants receiving the depot milk was greatly less than in the town as a whole. This could not, however, be altogether attributed to the influence of the depot milk. In an uncontrolled milk depot there is great risk of encouraging artificial feeding, owing to the saving of trouble to the mother in obtaining the milk already prepared for the infant. How far this occurred in England is not known, there being no data, but those who have had any experience of infant consultation work know how often a mother is convinced that her milk is insufficient, and it requires the evidence of the baby's weight curve, a test feed, and medical authority to persuade her to the contrary. Such cases would naturally resort to a milk depot in the absence of a consultation.

In this connection I should like to quote to you a sentence which occurs in this year's report of the Association for the Prevention of Infant Mortality of the Düsseldorf division of the Rhine Province. This association is admittedly the most advanced in Germany, and its experience can therefore be accepted. The sentence is, "In spite of all precautionary measures, in places where milk kitchens are in operation, there is a fall in the percentage of breast-fed babies; this is beyond question a fact, and has been shown by special statistics, and has been further especially proved in our own division."

Further, the depot milk not infrequently fails at the crucial moment, namely, in the hot summers, and the same Düsseldorf report touches upon the unfavorable results which have sometimes been obtained with depot milk during the summer quarter, presumably owing to the souring of the milk.

In England, whilst it was becoming apparent that milk depots were very expensive institutions, and that the clientele did not appreciably increase, attention became directed along other lines.

The preliminary movement started by Dr. Moore, of Huddersfield, in connection with the notification of births in that town, led ultimately to the Notification of Births Act of 1907.[1] This act rendered the birth of any child notifiable within 36 hours after birth, on pain of the infliction of a fine for failure to make

[1] This notification is distinct from registration. Registration has been compulsory for many years, and must take place within six weeks after birth.

such notification. The act may be adopted by any town or district, but is not compulsory. In adopting the act, it is required by the local government board that it be shown that arrangements have been made for the visiting of the infants, whose births are notified by trained women. The beneficial effects of this act have been, and continue to be, far-reaching. It has led to a vast and always increasing amount of effort on the part of the municipalities in the prevention of infantile mortality. It will perhaps simplify matters if this aspect be dealt with first of all, before considering the vast and likewise increasing amount of work which is being carried on by voluntary effort.

Many of the large towns at once adopted the Natification of Births Act, and began to make provision for the working of it. Birmingham may fitly be taken as a good example of the type of work which is being carried on in this connection, and of the results obtained. Almost identical methods, however, are followed in Manchester, Glasgow, and many other towns of smaller size, but those of Birmingham have been thoroughly analyzed, and are therefore readily applicable.

The Notification of Births Act was adopted in 1908, and a woman doctor, Dr. Jessie Duncan, and two health visitors were appointed to carry on the work of visiting the notified births, their efforts being concentrated upon the worst quarter of the city, namely, the wards of St. George and of St. Stephen.

The infants are visited soon after notification, and are kept under supervision, being brought up to the consultations held by Dr. Duncan, and regularly visited by the health visitors, cases of sick children being also visited by Dr. Duncan. The results of this system of supervision were almost at once apparent, but the crucial test was put to them last year in the shape of one of the hottest and most prolonged summers which had been recorded either in England or on the Continent for many years. Before 1911, the mortality for Birmingham, as a whole, had fallen gradualy from 132, in 1907, to 114, in 1910. In 1911 it rose to 150. In the wards (St. Stephen's and St. George's) where the organized visiting was being carried on, the mortality among infants in 1910 was 20 per cent and 12 per cent, respectively, below the average for the preceding five years; in 1911, although the mortality in these wards was considerably higher, in St. Stephen's ward it was still 1 per cent lower than the average for the preceding five years, and in St. George's it was 22 per cent. In other wards of the town, however, it was from 36 to 46 per cent higher than for the average five preceding years. The mortality results were highly satisfactory. Mortality is not the only criterion of the results obtained. The general health of the children, their cleanliness and tidiness, and that of their mothers, is reported to have

greatly improved as a result of the consultations. The active encouragement of breast feeding, and of partial breast feeding among mothers who were obliged to work, has resulted in 71 per cent of the employed mothers being able to partly breast feed their infants, whilst among the non-working mothers the percentage of breast feeding has risen from 75.1 to 79.1 per cent.

The condition of the children as to health has been studied and classified, the results being arranged in three headings: Good health, fair condition, and poor health. Dr. Duncan's report shows that there has been an increase of 4 per cent (from 59 to 63 per cent) in the children in good health, with a corresponding decrease of those in poor health; those in fair condition remaining stationary at 27 per cent, these figures being for the years 1909 and 1910.

This means a very substantial improvement in the general health of the children in these wards, and the Medical Officer of Health hopes to extend the work to other wards.

A fair number of the largest towns have now appointed women doctors, in some cases as assistants to the Medical Officer of Health, to supervise the work of the health visitors on lines similar to, if not identical with, those just described for Birmingham. The general feeling is that this method of dealing with the health of the infant population is extremely satisfactory. Before passing on to the work which is being carried out by voluntary agencies I should like to mention the case of Glasgow. A milk depot was established in this city in 1904, and later, in connection with the adoption of the notification of births act, Dr. Florence Mann was appointed as assistant Medical Officer of Health. She conducts consultations and supervises the health visitors, as already described. In 1909 it was found that there were a considerable number of children who were attending the consultation who were receiving depot milk, and a comparison was instituted as to the rate of growth and general well-being of these children who were under medical supervision, but of whom some were receiving town milk, under the direction of the doctor, and the others were receiving the costly depot milk. It was found that no appreciable difference could be detected between these groups of children. As a result of this investigation the milk depot was closed on the advice of D. Chalmers, the Medical Officer of Health for Glasgow. I hope it will not be supposed that, in this remark, I am underrating the value of pure milk. This is not the case, and I think there are some special cases where a milk depot may be a real benefit, but, where the mixtures are fixed, as they invariably are with us, the need for the depot would appear to be so limited as not to justify the expenditure of so much money.

The large mass of work which is being carried out by voluntary agencies must now be considered. I believe that the earliest effort

in this direction was the founding of the Westminster Health Society, in 1903; this society consisted of a committee of persons interested in social matters, who visited in the district and did many kinds of work. As regards infants, with whom we are more particularly concerned, arrangements were entered into with the large voluntary hospitals in the neighborhood to notify the society of cases of expectant mothers who were to be attended in their confinements by doctors from the hospital, and these were visited by the visitors of the society. Other health societies have gradually grown up since this date and there are now a large number of these bodies in the kingdom. The St. Marylebone Health Society, which was started in 1905, was the first society to have an infant consultation attached to it. This was started in 1906, on the initiation of Dr. Eric Pritchard, and was the first infant consultation to be started in this country apart from the very general supervision which had been exercised in some few cases by the Medical Officer of Health over the children having the depot milk. The great success of this consultation speedily led to the establishment of others, and there is no doubt that the infant consultation movement has come to stay, since there are now some 200 or more in the kingdom and the number is rapidly increasing. In general, and this is increasingly the case, the consultation is held in connection with a Health Society, the society undertaking the visitation of the cases attending the consultation. The health visitors, who are sometimes salaried and sometimes voluntary, attend at the consultations, hear the directions given, and subsequently see that these directions are carried out in the homes. In most places the Health Society endeavors to work in cooperation with the Local Municipal Authority, and, in very many cases, with profit to both parties. In St. Marylebone, where the relations between the municipal and the voluntary workers are of the most friendly type, all the babies whose births are notified are visited at intervals, either by the salaried municipal health visitors or by the voluntary visitors of the health society. The difficult cases are referred to the consultations, of which there are two held in different centers on several days of the week; there are too many children for the ideal plan to be followed, namely, that all the children should be under medical supervision. About 500 cases are referred to the consultations every year.

A few difficulties have occurred in connection with the infant consultation movement, which are, however, in process of solution.

The first difficulty is the Medical Officer of the consultation. Many people still consider that a trained nurse is quite competent to hold the consultation. This we are energetically combating. The Association of Infant Consultations and Schools for Mothers has laid it down that no society shall be considered as holding a consultation

unless every child under the age of 6 months who is brought to the consultation is seen at least once a month by the presiding medical officer.

The next point is the difficulty of getting a medical officer, since the work is unpaid, and not every medical man or woman is suited for the work. Budin's saying that an infant consultation is worth exactly as much as the presiding doctor is still most true.

We in England have not yet grasped the importance of every medical man or woman having at least some knowledge of the feeding and the minor ailments of babies, and we sadly lack any means of training medical students in these most important matters. Feeding cards of the most antiquated and, to our modern knowledge, terribly fallacious type are still handed out from institutions which should be centres of enlightenment.

Then the question of health visitors also presents some difficulties. They should be trained and be salaried. Satisfactory voluntary health visitors are the exception, but the society often finds it impossible to provide the necessary funds for a salaried health visitor. Before concluding my remarks about infant consultation I must mention the work of the schools for mothers. The first of these was started in St. Pancras, London, some five years ago, and an infant consultation was connected with it. The mothers are taught to cook, sew, and mend, and to wash the babies, etc. Dinners are also provided for expectant or nursing mothers. A large number of these schools are now in existence, with infant consultations attached, and the number of these is also rapidly increasing.

The combined infant consultation and schools for mothers movement is undoubtedly a most valuable agency for the improvement of the health and the reduction of the mortality among infants and young children. The results obtained are most satisfactory, and the immensely educative influence of the whole system is, to my mind, one of its most promising features.

Before closing I want to say a few words about the feeding of the consultation babies. The aim of the consultation is to promote breast feeding, and the number of artificially fed babies is relatively small. For these milk is not provided. They are, if possible, referred to a reliable dairy in the neighborhood, but, as a rule, no extra precaution is taken, and the prevailing, if not universal, custom is to boil the milk before using. During the last three or four years there has been a development in favor of giving dried milk to babies; that is, it is sold at the consultation to the mothers.

A great point is made at all the consultations, whether municipal or not, of not giving any financial assistance. If cases are really

shown to be necessitous, assistance is obtained for them from some local charity, but it is made clear to the recipient that it does not come from the consultation.

Dried milk is now used on a large scale at Sheffield, Leicester, and St. Marylebone. Glaxo was used at Finsbury before the closing of the milk depot and the results obtained were entirely satisfactory. At Sheffield Glaxo is also used for the babies who are under the supervision of the medical officer appointed by the municipality. At St. Marylebone we now use Trumilk very largely, with excellent results. The case of Leicester is of sufficient interest to warrant further comment. The Leicester milk depot was started in 1906, with modified cow's milk sold in bottles in the usual way. In 1907 there was an average of 202 children on the books, and the cost to the rates was £339 5s. 3d. ($1,500 to $1,600).

Toward the end of 1907 the medical officer of health, who personally conducted a consultation at the depot, commenced the use of dried milk. The expenses at once began to decrease and the number of babies to increase, so that in 1911 the average number of babies on the books had risen to 325, and there was an actual gain to the rates of £41 3s. 7d., £1,060 6s. 7d. having been spent in the purchase of dried milk, no modified milk having been used at all.

The dried-milk phase has started well, and the consensus of opinion is greatly in its favor. The fear of producing rickets or scurvy is gradually dying out in face of strong evidence to the contrary, although in view of the fact that dried milk is sterilized milk some doctors recommend, especially for weakly babies, the additional administration of a little fruit juice.

Perhaps the ideal method of milk supply to consultation babies is that adopted by the municipality of Berlin. Here raw milk, kept cool, and of the quality of American "inspected milk," is supplied at market price to all the artificially fed infants attending the municipal consultations. About 30,000 attend these consultations every year, of whom only a small percentage are, however, artificially fed. The consultations are held at seven centers by children's specialists, who attend every day of the week, with three or four assistant medical officers and a staff of health visitors. The milk is boiled and prepared by the mother in the home, under the direction of the health visitors, the modification being prescribed by the medical officer of the consultation.

Such is the brief outline of the infant-welfare movement in Great Britain.

At present there is some degree of separation between voluntary and municipal work, but I believe the time to be not far distant when the voluntary work will be taken over by the municipality; that is

to say, it will be recognized that the health of the child population is of such importance as to justify the expenditure upon it of the money of the community among which the children reside.

We have had to learn our lessons by bitter experience, with little or no support from the mass of the community, but, looking back over the past five or six years, I think that the progress has exceeded even the most sanguine forecast which could have then been made.

MUNICIPAL SUPERVISION OF MATERNITY.

S. W. NEWMAYER, M. D., in charge of Division of Child Hygiene, Bureau of Health, Philadelphia.

In at least 10 large cities of the United States there have been active and concerted efforts in the past two years to reduce an evident and unnecessary mortality among infants. While the greater part of the work has been done by private organizations, in most cities the health authorities have cooperated. Three cities have bureaus of child hygiene, with well-organized systems devoted to this special public-health problem. With campaigns of education through visiting nurses, physicians, and exhibits, and by assuring supplies of pure clean milk, successful results have been attained in some of these cities. Those health officers who have been active in planning such work now realize that there is a limit to the results that can be obtained. With a close study of cause and effect as seen through vital statistics diseases of infants were divided into the preventable, partly preventable, and nonpreventable. The preventable included diseases of the gastrointestinal tract, the respiratory diseases, pneumonia and tuberculosis, and the communicable diseases. In several cities public-health movements reduced the mortality from these diseases.

There remained uninfluenced and stationary a class of diseases classified as partly preventable. These were the diseases of early infancy, congenital debility, premature births, injuries at birth, and so-termed stillbirths. Vital statistics, the index to our efforts, have been sadly lacking, and the important rôle that these diseases played in infant mortality has been underestimated. Statisticians have heretofore tabulated deaths by yearly periods, requiring the United States Government, in their census on mortality previous to 1910, to omit a most important tabulation—the deaths in monthly periods in the first year and the daily periods in the first week. This new classification admits of a study which explains the reason for the limit in reducing infant mortality by the present health movements in our cities.

Deaths for the registration area of the United States for the year 1910, by days, weeks, and months.

Cause of death.	Under 1 day.	1 day.	2 days.	3 days.	4 days.	5 days.	6 days.	Under 1 week.
All causes	14,946	7,505	4,453	3,359	2,400	2,031	1,657	36,351

Cause of death.	Under 1 week.	Under 1 month.	First month.	Second month.	Third month.	Fourth month.	Fifth month.	Sixth month.	Under 1 year.
All causes	36,351	58,089	15,223	12,923	11,358	9,828	8,618	8,198	154,373
Diarrhea and enteritis	684	4,477	4,692	4,980	5,080	4,672	4,129	3,797	44,695
Communicable diseases	67	713	837	643	590	590	530	620	6,621
Tuberculosis	32	127	152	175	211	212	228	254	2,416
Pneumonia	712	3,157	2,010	1,852	1,596	1,517	1,343	1,469	19,036
Syphilis	228	608	369	247	136	89	58	48	1,658
Convulsions	1,144	2,070	434	319	244	197	177	165	4,089
Malformations	4,280	5,901	502	297	176	149	110	88	7,501
Premature births	16,197	19,498	582	195	.....	.....	.....	.....	20,275
Congenital debility	5,943	10,273	2,863	2,118	40	12	11	12	15,371
Injuries at birth	3,430	3,689	28	8	.....	.....	.....	.....	3,725

Classification of all deaths under 1 year in respect to preventability by means of present health movements.

Total deaths under 1 year	154,373
Class I. Preventable and partly influenced by present health work:	
Diarrhea and enteritis	44,695
Diseases of stomach	2,874
Pneumonia	19,036
Tuberculosis	2,400
Contagious diseases	6,621
Total	75,626
Class II. Preventable and not influenced by present health work:	
Premature births	20,275
Congenital debility	15,371
Injuries at birth	3,725
Malformations	7,501
Convulsions	4,089
Syphilis	1,658
Total	53,019
Class III. Partly preventable: All other diseases	25,727
In United States (registration area, 1910):	
Deaths under 1 year, all causes (19.2 per cent of total)	154,373
Deaths in the first month (37.6 per cent of deaths in first year)	58,089
Deaths in first week	36,351
Premature births, congenital debility, injuries at birth, malformations, and convulsions (almost one-third of all deaths under 1 year)	50,960
Above deaths in first month (80 per cent)	41,431

In State of Pennsylvania:	
Deaths under 1 year (24 per cent of total deaths, all ages)	28,377
Deaths under 1 month (33 per cent of deaths under 1 year)	9,548
Congenital affections (31 per cent of deaths under 1 year)	8,862
In Philadelphia (1911):	
Deaths under 1 year (17.6 per cent of total mortality)	4,636
Preventable diseases	2,068
Diseases of early infancy	1,480
Nonpreventable	1,015
In Germany (Prof. v. Franque, of Giessen):	
Deaths before birth	63,000
Deaths in first 15 days	80,000
In England and Wales (1909):	
Under 1 month, per cent of deaths under 1 year	36.5
Under 1 week, per cent of deaths under 1 year	22.7
Wasting diseases, per cent of deaths under 1 year	38.3

The early deaths include (1) abortions and miscarriages; (2) deaths during labor, including (*a*) accidents and injuries during labor, and (*b*) stillbirths; (3) deaths during the first week of life from (*a*) premature births, (*b*) congenital debility, (*c*) forces acting during intrauterine life, syphilis, malformations, convulsions, and (*d*) injuries at birth; (4) deaths during the first month of life.

In the registration area of the United States, in 1910, 37.6 per cent of the deaths in the first year of life occur in the first month and almost two-thirds of these deaths occur in the first week. One-third of all deaths under 1 year are due to premature births, congenital debility, injuries at birth, malformations, and convulsions, and 80 per cent of these deaths occur in the first month; 36,351 deaths in the first week, and almost one-half of these occur in the first day. It is evident that improper food or feeding, with resulting gastro-enteric trouble, is a negative factor in these deaths. The lives of most all of these infants were uninfluenced by conditions arising after birth. This mortality must be assigned to prenatal conditions and conditions arising at birth.

Except a very small amount of prenatal work performed in four cities of the United States, there is little of our public-health work that can influence the early infant deaths. A close study and analysis of the causes and number of deaths in the first month and first week of life give sufficient evidence that there should exist certain municipal supervision over the period of pregnancy, and during labor and the first month of life.

My excuse for presenting this contribution to this congress is to offer some suggestions as to possible methods of control of the early deaths.

While vital statistics do not include abortions, miscarriages, and stillbirths, it seems but fair, in a consideration of early deaths, to include the possible infant.

It is impossible to estimate the number of abortions and miscarriages, but it has been variously estimated at about 10 per cent of the pregnancies. Social duties, financial conditions, work, nationality, and intelligence are some factors influencing the number of these deaths. Abortions and miscarriages are more frequent among the native-born Americans than among foreigners, due possibly to greater social aspirations of the native-born American. Intelligence increases the desire for fewer pregnancies and small families. More full-term pregnancies are found among the poor, due possibly to ignorance of methods of abortion or a realization that abortions are dangerous and more costly than infants. Poverty, when requiring the mother to work in factories to the last days, is an important causative factor in causing abortions, miscarriages, and premature births. Germany, Denmark, Holland, and Switzerland have laws regulating the employment of women in the latter months of pregnancy. No such laws exist in the United States, and their enactment and enforcement by our cities would prove of great value. Regulation of employment would in some cases seem to make hardships, as these mothers work only out of necessity to help to support the family. These conditions, if they arose, could easily be met by the organized charities. Unfortunately a few charities when applied to for aid send mothers to work during pregnancy and soon after delivery encourage weaning, to admit of the mothers returning to work. To aid in the reduction of infant mortality, especially in the first month, charity must be freely dispensed when asked by pregnant women, and the aid must be furnished without red tape. I have known women in the last months of pregnancy to be compelled to work 10 hours daily sewing at a machine and earning about 12 cents a day. Added to which work she has the responsibility of care of her other children and household duties. Where such cases can not be met by the private charities the municipal government should support such families for a few months.

Abortions and miscarriages, when due to disease of the woman or the generative organs, could often be averted by early thorough examinations and treatment by the medical attendant. A lessening of the social evil by education of the public through campaigns by health departments and others will, in time, give results.

Stillbirths, which invariably include those born and living a few moments to a few hours, have been estimated by available statistics to be 2 to 5 per cent of the total number of births. For various reasons these deaths are not included in the general mortality rate. That this mortality remains stationary, and possibly has increased, is shown by the following rates for the past 10 years in the city of Philadelphia:

Births, stillbirths, and premature births in the city of Philadelphia, 1902–1911.

Year.	Births.		Stillbirths.		Premature births.	
	Number.	Rate per 1,000 population.	Number.	Rate per 1,000 births.	Number.	Rate per 1,000 births.
1902	29,841	22.1	1,382	46.3	527	17.7
1903	31,028	22.6	1,323	42.6	778	25.1
1904	32,223	23.0	1,788	55.5	499	15.5
1905	33,339	23.4	1,903	57.1	457	13.7
1906	34,771	24.0	1,841	52.9	497	14.3
1907	35,142	23.8	2,004	57.0	565	16.1
1908	36,641	23.7	2,036	55.6	609	16.6
1909	37,540	24.6	1,827	48.7	602	16.0
1910	38,676	24.9	2,026	52.4	500	12.9
1911	40,044	25.3	2,131	53.3	559	14.0

The same causative factors for abortions and miscarriages are responsible for stillbirths, added to which is carelessness or ignorance by the attending physician, midwife, or student. Stillbirths and deaths during labor from accidents and injuries can be studied with the deaths occurring during the first week and the first month of life. An analysis of the mortality census of the United States for 1910 shows that 41,431, or 80 per cent, of the 58.000 deaths in the first month are due to premature births, congenital debility, injuries at birth, malformations, and convulsions. From these and similar statistics from other countries, one can make but one logical deduction, namely, that somewhere, and by some one, there are lacking the necessary precautions for protection of mother and child in maternity. There seems to be many ways in which the municipal governments could aid in such protection by interest and supervision. With the recent advances in medical skill and preventive medicine, most of these early deaths should be included in the class of preventable diseases. The question to consider is how the proper municipal authorities can help in assuring proper care and nourishment during the period of pregnancy and in giving financial aid when needed. How to best educate the mother in seeking early competent medical advice and treatment, assuring skilled medical supervision during labor, and careful nursing of mother and baby for at least two weeks, and observation past the first month of convalescence. Investigation of these early deaths in many cases shows a total lack of hygiene during pregnancy and lack of care and skill during and after delivery. There must be a realization that childbirth is not merely the period of labor, but an equally important period of gestation, as well as three to four weeks of convalescence following the birth of the child.

Obstetrical cases are attended by physicians, midwives, and students. They are attended at home, in hospitals, and private mater-

nities. The accoucheur is morally and should be legally responsible for the entire time. This responsibility must include both mother and baby, from the time the physician or attendant is first consulted, until the infant has a start in life. Most women engage the services of some one at least one to two months before labor. A small percentage consult a physician only when labor begins, and in the State of Pennsylvania, it has been estimated that 5 per cent of the births are unattended by any medical attendant or midwife.

In Pennsylvania there were, in 1911, 210,000 births, 35 per cent of which were attended by the 3,000 midwives in the State, 15 per cent by hospitals, dispensaries, and maternities, 5 per cent without attendance, and about 45 per cent by physicians. In Philadelphia during 1911, there were 40,666 births, 25 per cent being attended by midwives, 5,825, or 14.5 per cent, by hospitals, maternities, and dispensary outdoor service. As many physicians connected with hospitals, especially teaching institutions, report all births under their name, this factor would reduce, below 60 per cent, the true number of obstetrical cases attended by private physicians.

It is not my intention to discuss the relative efficiency of the different classes of obstetricians. The physician is licensed by the various State medical examining boards after a course of training in more or less reputable medical schools. Such courses of study are supposed to include a practical training in applied obstetrics. The responsibility of supervision by the State is complete when its medical examiners make the requirements to obtain a license to practice medicine in all of its branches sufficiently stringent to exclude those applicants who are incompetent. The remainder of the responsibility is up to the medical colleges.

Fifteen per cent of the births are reported by hospitals and dispensaries, the greater number of these cases being attended by students. This training is needed to assure a practical course for the students. We should, however, demand that all cases be under the direct supervision of competent instructors. This would not detract from the value of the teaching, but, on the contrary, add to the training. It should be compulsory for the students to visit all expectant women assigned to them for delivery frequently during the last two months of pregnancy and report conditions to the instructors. They should also be compelled to make daily visits for at least two weeks following labor, giving similar reports on mother and baby.

Sixty-one hospitals and dispensaries in Philadelphia report births, and over 80 per cent of these births are reported by 12 hospitals that have students. Three of the hospitals having students have five trained nurses for the outdoor service.

No nurses are employed by other hospitals doing obstetrical work at homes and not having students. None of the nurses visit the expectant women previous to the time of labor. It must be evident that these existing conditions must materially increase the mortality among infants in the first month, especially from stillbirths, premature births, accidents, and congenital debility.

There can be little dispute that a well-regulated maternity hospital is the ideal place for obstetrical cases, especially where the facilities and conditions are wanting in the home. There remains one weak place in this supervision—inability to observe most cases in the last month of pregnancy and the too early discharge of mother and baby. This disadvantage could be met by visiting nurses going to the homes of all cases discharged from the maternity wards of a hospital, such visits to continue until the baby and mother have entirely convalesced. Where needed, homes should be supplied for those mothers requiring further care after discharge.

There should be legislation which would require all hospitals and dispensaries conducting an outdoor service to report to the health officer the names and addresses of all expectant women presenting themselves at these institutions for confinement. The city authorities should have trained nurses detailed to visit these prospective mothers during the last month or two of pregnancy, observing any signs of abnormality, instructing the mother in personal hygiene, care of the breasts, and preparing the mother for the time of labor. The nurse should continue her visits after the birth of the child, in order to instruct in the care and feeding of the baby. Such precautions would reduce materially the early deaths by avoiding many accidents and would also assure more breast-fed babies. In such work the visiting municipal nurse would be a logical solution of the midwife problem. Foreign mothers, realizing the care and attention given to them, would naturally wean themselves away from the services of careless and uncleanly midwives, and those midwives remaining in practice would be compelled to become more skilled and painstaking in their work.

Private maternities should be abolished by legislation. Such institutions have no excuse for existence. Most cities have ample hospital accommodations for obstetrical cases, both pay and charity. These private maternities, with but few exceptions, are existing only for illegal and illegitimate work. Laws licensing and regulating their practice seem to be of little value. These institutions are difficult to locate and then difficult to supervise. Philadelphia, with laws, rules, and regulations for licensing private maternities, has succeeded in granting licenses to 28 in the past 10 years. Eight of these had their licenses revoked, and all others except five failed to renew their

licenses. They have reported 329 births in the past four years. I am confident that many unlicensed maternities exist. Of the seven licensed maternities remaining in 1911 the department revoked the license of one for illegal and irregular work and caused the arrest and conviction of another for trafficking in babies. These maternities deal almost entirely with the illegitimate births and pave the way for disposal of the infants. They have been known to agree to relieve the mother of her baby for a stated sum. If the child does not die in the institution, it is placed out to board, and the longer the child lives the less is the profit for the institution.

The death rate among the illegitimate births is large. This could be materially decreased by the public hospitals and maternities encouraging the use of their wards, and impressing on the mother that there will be strict professional secrecy upon which she can rely.

The midwife of late years has been much discussed and abused. In some foreign countries she holds sway, but with numerous institutions for her training and continuous supervision by the governments her work is more or less successfully under control. In the United States, although she attends to 40 to 50 per cent of the births, few cities have strict supervision over her. In Philadelphia the midwife attends to 25 per cent of the obstetrical cases, in New York about 45 per cent, and in Chicago about 85 per cent. If she were to attend only to normal cases of labor a number of midwives would perform their duties well. But labor must include pregnancy and the period of convalescence. How many midwives examine their patients previous to labor? And, if they did, how many are trained to observe an abnormality? While they are trained and licensed to attend to normal labor, who knows at what moment a seeming normal case may become abnormal? Licensing and supervision can accomplish much, but few American cities have such supervision. These laws should be properly constructed; not too highly specialized and not so radical that there is little possibility of securing a full enforcement and satisfactory results. Licensing, without supervision by the health authorities, is worthless. Supervision which includes only an examination of their outfits and an occasional inspection of their homes accomplishes little. Talk of abolishing midwifery is sheer nonsense. A profession of the proportions of midwifery, with sufficient hold on women to attend to 40 to 50 per cent of the cases, can not be abolished by the mere enactment of laws. Education of the mothers may, in time, win the women to safer and saner methods of intrusting their lives and the lives of their offspring. But we must supply the substitute for the midwife, and it must be a good one.

While waiting for the physician to take his rightful place in obstetrics, every municipality should license all midwives and keep a strict

supervision over them. A midwife should not only report all births within a few days after delivery, but should be compelled to report to the health department all cases for which her services are engaged. To these cases should be sent a visiting nurse to observe and report on conditions until mother and infant are fully convalesced. One of the large visiting-nurse societies makes the grave mistake of refusing to send a nurse to any case under the care of a midwife. It is thus withholding its help where it is most needed.

In an overzealous desire to furnish breast feeding a number of institutions and physicians scour the cities for wet nurses. Mothers are found to accept the position of wet nursing for children deprived of their birthright. These women are often forced to wean their own infants and board them out, in which case they invariably die. The mother does this only because she needs the income to live. Often she is unmarried or deserted by the father of the child, and is too willing to sacrifice her baby. The institution or physician is unconsciously guilty of sacrificing one life for another.

Health departments should control, by licensing and supervising, all women engaged as wet nurses. A physical examination should be made of the applicant and a report made on the disposal of her own infant and her ability to nurse two children.

The practice of boarding infants is more common than suspected. It is a problem which has been difficult of solution. When the children are wards of the city care can be exercised in the homes utilized for this purpose, and by frequent inspections a supervision can be maintained over the care of the infant. These women should receive careful instructions in the care and feeding of infants. Even more care is needed in the infant not a ward of the city who is boarded out. The mortality among these, as well as among wards, is great.

The mortality in foundling institutions is estimated at 50 per cent and over. This is due, not to neglect, but to inadequate care, too few nurses and attendants, and too little individual attention. Infants may thrive with but little effort at home, but in an institution they require much care, attention, and thought. There should be frequent inspections of all such institutions by health officers. The number of infants allowed under the care of one nurse should also be defined by law.

Philadelphia has, by act of legislature, the right to license and supervise all houses boarding three or more infants under the age of 3 years. This limitation is a grave mistake. Every city should have supervision over every infant boarded. Every woman acting as a foster mother to even one baby should be investigated in her home, and the boarded infant inspected at frequent intervals. In a law with such limitations, while you protect the threes, or more, the ones and twos are left to die.

There is much of interest that could be added to this contribution, but I have omitted detailed descriptions and statistics and offer this brief study to evoke discussion that may aid in solving the problem of reducing the mortality among infants, especially in the first month of life. Not only is the number of these early deaths augmented by lack of care and by neglect, and ignorance during the puerperal period, but a considerable number of the inmates of our institutions are those who have survived the dangers.

DISCUSSION.

Mrs. William Lowell Putnam, chairman of the Committee on Infant Social Service of the Woman's Municipal League of Boston: What Dr. Newmayer has said about the importance of prenatal care interests me very much, for we have, for over three years, been doing prenatal work in Boston through a committee of the Women's Municipal League.

In this time we have carried to confinement 1,267 women. There has been no death in pregnancy during the whole period, and but three of our cases have died in childbirth. I can not agree with Dr. Newmayer that it is time enough for the women to register when they are within two or two and a half months of confinement. Our most interesting case was that of a woman who had been under our care for a short time with her first baby. She had a contracted pelvis, and the baby was injured by a high-forceps delivery and died of cerebral hemorrhage within a week of birth. With the second child, whose picture, at 19 months old, hangs in our exhibit here, she put herself under our care at once, and the picture speaks for the result. With the third pregnancy, she followed the advice of her neighbors, who said the sixth month was early enough to register, and, at five months, she miscarried.

Besides the number of women carried to confinement, we have cared for 200 to 250 others for as much as a month or more, who, for some reason or other, were lost sight of. Among all of our cases we have had but three miscarriages. Two occurred during the first year, one in the second, and none at all for the past two years.

Another interesting result has been the reduction in the number of cases showing symptoms of threatened eclampsia. The first year of work it was 10.2 per cent, a fairly average number; the second year it had dropped to 4.8 per cent; and in the third year it was only 1.7 per cent—a decrease of 600 per cent. Among the whole number, we have had four cases develop, and we are now not only testing the urine, but taking the blood pressure at every visit, in the hope of learning something which may help to prevent these cases. The cases are plotted on a chart—20 cases to each chart, and five of these charts

are hanging up in our exhibit. We never allow more than 10 days to pass between the nurse's visits, and, if anything is wrong, she goes as much oftener as may be necessary. The number of stillbirths has been 2.7 per cent and the number of premature babies 1.89 per cent. Counting all of these, the birth weight of our babies has been 8½ ounces above the general average as given by Dr. Whitridge Williams, and the cost of the work is $2.61 per patient. This sum we encourage the women to pay wherever possible, for we believe that it is much better for them to do so, and also feel that a self-supporting work is capable of indefinite development, which can never be the case with one supported by charity.

It seems to us that the results, both to the women and to the community, justify the cost of the work.

THE PROPHYLACTIC AND THERAPEUTIC VALUE OF FRESH AIR IN SCHOOLS AND HOSPITALS, INCLUDING HELIOTHERAPY.

[Illustrated by lantern slides.]

JOHN W. BRANNAN, M. D., President Bellevue and Allied Hospitals, New York.

The title of my paper does not fully express what I wish to talk about this morning, for what I have in mind is not so much the air within the school and within the hospital as it is the absolutely pure fresh air to be found just outside their walls. Not all of our school children nor all of our hospital patients can be taught or treated in the open air, but a very large proportion of those who need it most can enjoy this privilege, and it should be our duty as physicians and guardians of the public health to see that they get it to the largest possible extent. Those who must remain indoors should receive the maximum amount of fresh unaltered air that can be admitted through open windows and transoms. I shall attempt to show rather by pictures than by words what has been accomplished in schools and in hospitals up to the present time.

It was a long time after the discovery in 1882 of the bacillus of tuberculosis by Koch before the outdoor treatment of pulmonary tuberculosis became thoroughly established. But many years before 1882 tuberculosis of the bones and joints and glands in children, known probably then as scrofula, was treated in the open air. The hospital at Berck on the coast of France was established by the city of Paris in 1861, the French believing that this form of tuberculosis was favorably influenced by the air from the sea. Even long before this date, in 1797, a hospital was founded by two English physicians at Margate, on the coast of England, for scrofulous disease in adults as well as in children.

This is the only institution of the kind in England, but on the Continent there are between 75 and 80 marine sanitoria, situated on the Baltic, the North Sea, the Atlantic Ocean, the Mediterranean, and the Black Sea. The original municipal hospital at Berck has been followed by several large private institutions, so that there are now at Berck between two and three thousand beds for children with surgical tuberculosis, about half of them maintained by the city of Paris, the others supported by private endowment. In 1904 the Association for the Improvement of the Condition of the Poor of New York, impressed by the favorable results obtained at Berck, decided to establish a small hospital for children with surgical tuberculosis at Sea Breeze, the summer home at Coney Island, which has been maintained for many years by the association for the children of the tenements of the city. The number of beds is restricted to 43, but now that the city has finally purchased Rockaway Beach we have reason to expect that a new hospital with 150 beds will be constructed and completed in the course of the next two years. The board of estimate and apportionment has voted to accept the hospital, for which $250.000 has been subscribed, as soon as it has been completed by the association, and to maintain it hereafter as a city institution. I shall content myself with showing a few pictures of the daily life, by night as well as by day. What I have seen at Sea Breeze during the past nine years has led me to urge that not only our patients with pulmonary tuberculosis or with surgical tuberculosis should live in the open air, but that all of our patients, whatever their disease may be, and all of our school children, whether predisposed to tuberculosis or not, shall be placed in an atmosphere approximately the same as that out of doors.

At Berck, as at the other European seaside sanitaria, the children pass the day on the beach or on balconies open to the air and sunshine. This régime was adopted at Sea Breeze, and in the nine years since the opening of the hospital there has not been a day, in all seasons and in all weathers, that the children, including bed cases, have not been in the open air. At night the windows of the wards are wide open throughout the year. In the warm season the sashes of the windows are entirely removed. From April to November about one-third of the children, as many as can be accommodated, sleep on the open porch. Throughout the summer months the ambulant children bathe in the ocean every day, and the nurses repeatedly call attention to the rapid improvement of the patients and the closing of sinuses under the influence of the sea water. During school hours the children are in a room with open windows or in a tent open on all sides, a teacher and a kindergartner being supplied by the board of education.

The good results obtained with the children at Sea Breeze were so striking that it was decided to provide open balconies in all the hospitals then in process of construction in the department of Bellevue and allied hospitals. Every ward has at least one balcony attached to it, so that every patient, whatever his disease, may have the benefit of the outdoor air. In addition to the balconies there are large wide loggias at Bellevue and extensive lawns and roof gardens at all the hospitals but one. Gradually storm sashes and louver windows are being added to the balconies, so that even in the winter the patients can be moved out of doors, one or more sides of the balconies being always open for the free entrance of the outer air.

It is unnecessary for me to emphasize the stimulating effect of this treatment. In one disease, the acute pneumonia of children, an attempt has been made to reduce the results to figures. Previous to November, 1908, the children with pneumonia were cared for in a large sunny ward in the old building. The ward was fairly well ventilated, but there was no opportunity for outdoor treatment. After moving into the new building it became customary to place the children on the balconies for three or four hours a day, unless the weather was too stormy. The good effects of the fresh air were so noticeable that in January, 1910, it was decided to place the patients on the balcony as soon as the diagnosis of pneumonia was made, and to keep them there throughout the 24 hours, and this practice has continued up to the present time. It was noted that the patients, with rare exceptions, improved in all their symptoms, especially during the winter months, but no comparative study was made until a few months ago. The results of this study are as follows: From January, 1904, to November, 1908, 274 children (1 year of age and over) were admitted to the hospital, and of these 69 died, a mortality of 25.2 per cent; in the second period, from November, 1908, to April, 1912, 391 children (1 year of age and over) were under treatment, of whom 42 died, a mortality of only 10.7 per cent. The observations of Dr. John Howland, the attending physician in charge of the children's service, and his assistant, Dr. B. Raymond Hoobler, apparently show that this remarkable effect of the outdoor treatment is largely due to the increased blood pressure caused by the fresh cold air. As these studies have been published, I shall not refer to them in detail, but simply state that the rise of the blood pressure out of doors was attributed by these observers to the reflex stimulation of the vasomotor centers by the action of the cold air on the skin of the face and the mucous membrane of the nose.

Infants under 1 year of age are also placed in the open air as soon as the diagnosis of pneumonia is made, and adult patients are treated on the balconies or in a room with the windows open so that the

temperature approximates that out of doors. These patients uniformly do well. The effect of the cold air in quieting the restlessness and delirium of pneumonia, especially in alcoholic subjects, is very striking.

Maternity cases are removed to the balcony in from 4 to 7 days after delivery; during the warmer months within 36 hours in some instances. The good effects are evident to all, and particularly to the women themselves. The nurse in charge states that the patients sleep better and call for less attention than when in the ward. A week or 10 days' (and nights) outing on a Bellevue balcony is not a bad substitute for Lakewood or Atlantic City.

Dr. Gregory, the hospital alienist, reports that the effect of open air upon the acute insane is very beneficial, especially in the excited and restless. It has a quieting influence and induces sleep. The same is true of the alcoholic patients, of whom there are thousands in the hospital annually. The fresh air and oxygen seem to furnish the stimulation which they greatly need, so that they eat and sleep well. It has been Dr. Gregory's experience that if alcoholics be kept in the open air they will recover much sooner than if kept in the wards. The tremulousness and anorexia and mental depression disappear very quickly. In functional nervous diseases the value of the open-air treatment is generally recognized. It induces sleep, improves the appetite, and supplies the general stimulation which patients of that class require.

Patients after severe operations gain rapidly when taken out of doors. In critical cases the stimulus of the fresh air often seems to turn the tide. The patients themselves are prompt to show their gratification, especially the women.

Passing on to the consideration of the open-air schools, we may divide them into three groups—first, those for children with pulmonary tuberculosis; second, those for children who are anemic, under weight, and ill nourished, and hence considered to be especially predisposed to tuberculosis; and, third, those for normal school children who are neither tuberculous nor predisposed to tuberculosis or any other disease.

The open-air school movement began in 1904 with the "Waldschule" at Charlottenburg, and was followed in 1907 by the outdoor school at Bostall Wood in the outskirts of London under the auspices of the London county council. Other schools were soon established in various parts of England, of which those at Bradford and Sheffield are perhaps the best known. In January, 1908, the movement spread to the United States, and with the opening of the school term this autumn there will be in operation over 200 fresh-air schools and classes for tuberculous, anemic or normal children, according to a statement of the National Association for the Study and Prevention

of Tuberculosis. In Germany and in England structures especially designed were erected. In this country we have been content as a rule to make use of buildings already in use, either by selecting a room facing the south and altering the windows or by covering and partially inclosing a portion of the space on the roof.

The first school in the United States, with the exception of the hospital school at Sea Breeze already referred to, was opened in Providence. This was followed closely by the Franklin Park School in Boston. The Providence school is in an abandoned schoolhouse from which a portion of the south wall was removed and replaced by windows which can be trussed up to the ceiling. The class in Boston is on the roof of a building built for a refectory in a public park. It is freely open on all sides; protection in stormy weather is secured by curtains which can be dropped as desired. The results obtained in these schools were so satisfactory that they were soon followed by the establishment of similar classes in Hartford, Chicago, New York, and other cities. These schools vary greatly in their construction and arrangement, but they all agree in supplying fresh air in abundance to the pupils. In Hartford the class is held in a tent; in Chicago and in New York some of the classes are on the roofs of school or hospital buildings. In the Graham School in Chicago the fresh air is obtained simply by raising the windows of an ordinary schoolroom. Two of the New York schools are of especial interest, being located on the upper deck of old ferryboats.

Most of these classes are for tuberculous children who have been excluded from the public schools. The régime is the same in all—life in the open air, nourishing food, rest in bed after dinner, and the systematic use of gentle exercises. The results also are practically the same in all—gain in weight, disappearance of the physical signs, and improvement in general condition, both physical and mental. The teacher of the class on the *Gouverneur* ferryboat reports that of 37 children who had been in the class for periods varying from six months to a year, 30 had been readmitted to the public schools by the physicians of the board of education. It should be added that the pupils have not only regained their health, but have also kept pace in their studies with the other children.

In the second group of open-air schools belong the classes for anemic children established in the public schools of New York by the board of education. The children in these classes have no physical signs of disease, except enlarged glands in some cases, but they are anemic, under weight, ill nourished, and many of them from tuberculous families. The first class was opened in April, 1910, in public school No. 21, in Mott Street, the center of the congested Italian quarter. Forty such classes have been authorized by the board of education and at the present time 20 are in successful opera-

tion in various parts of the city. The same routine is followed as in the schools for tuberculous children. The food is provided by the committee on tuberculosis of the Charity Organization, a private society, all other expenses being met by the city, through the department of education.

The results in all the fresh-air classes are excellent. During the first winter the children in the Mott Street School gained on an average of 6 pounds apiece, with a corresponding improvement in all other respects. The increase in hemoglobin is especially interesting, starting at an average for the class of 71 per cent in the autumn the figures reached 85 per cent in the spring, whereas a control class of normal children in the same school declined from 87 per cent to 81 per cent during the same period of time. At the end of the school year the 21 children had so improved that they were returned to their former classes and a new group of anemic children took their places. Dr. Doty, the superintendent, reports that practically all the children in the school are anxious to join the fresh-air class.

As the cost of the extra food is considerable and seemed likely to limit the number of open-air classes, it was decided to lessen the amount of food in the new classes, and in some instances no extra feeding at all has been furnished, the children having only the usual dinner provided at home. As far as can be judged by a few months' trial the children in these later classes are doing nearly as well as in the original class of school 21.

The third group of open-air schools, those for normal children in the public schools, is in some respects the most interesting and full of promise for the future. Having demonstrated that pure air, fresh from out doors, can be given not only with safety but with great benefits to school children who are tuberculous or whose health is otherwise impaired, the next step is to give fresh air to all school children. A fresh-air class was opened last winter in public school No. 9 at the request of a number of parents of the children. With the permission of the board of education the room was cut off from the ventilating and heating system of the school building and the windows were kept open as in the anemic classes. The children receive no extra food, as the parents are well able to provide for them at home. Classes have also been opened—10 in all—in various private schools in different parts of the city. In Boston, Chicago, and other cities the movement for fresh-air schools for normal children is also making progress, so that it would seem to be only a question of time when all children will be taught in the open air.

In conclusion, I should like to say a few words about heliotherapy, limiting myself to its use in surgical tuberculosis, especially as practiced by Rollier at Leysin, in the Vaudois Alps, Switzerland. Rol-

lier established his hospital for the treatment of tuberculosis of the bones and joints as long ago as 1903, and has presented papers on the subject at at least three international congresses, but it is particularly during the last two years that his work has attracted attention. Other physicians had made use of the sun cure on the shores of the Mediterranean, joining it to the "cure marine," and Bernard had practiced it in the pure mountain air of the Engadine. It was the work of Bernard that led Rollier to select an elevated site for his hospital. I shall speak but briefly of his methods and his results, as the lantern slides present both so clearly that but little word description is necessary.

Leysin is situated at an altitude of about 4,500 feet above sea level. The hospital buildings face the south and are protected by mountain ranges from the cold winds of the north and west. Rollier states that even in midwinter the temperature on the sunny balconies is often as high as 45° to 50° F. Owing to the purity of the atmosphere and the absence of moisture there is no loss of the luminous and caloric radiation of the sun. The exposure to the sun is gradual, beginning with five minutes three times a day. This is steadily increased as pigmentation of the skin appears, until finally the entire surface of the body is exposed from sunrise to sunset. The head is protected as shown in the illustrations. With the development of the pigmentation the cure progresses until the recovery is complete; how complete it is may be seen from the picture of the two boys, the first of whom had 32 foci of tuberculosis, even the lungs being involved; the second, multiple lesions, including a badly disorganized anchylosed elbow, with seven sinuses and a history of three resections of the joint and forearm. Fever was present in both cases. After one year's treatment both boys are well, with complete return of function—full flexion and full extension—in the elbow of the second boy. I am not an orthopædic surgeon, but I know what is considered as a cure of a tuberculous joint. I have seen many such cures at Sea Breeze. Arrest of the disease with anchylosis of the joint in as useful a position as possible is accepted as a satisfactory result.

REMARKS ON THE ANTHROPOLOGICAL STUDY OF CHILDREN.

Prof. FRANZ BOAS, Columbia University, New York City.

If I venture to lay before you some brief remarks on the anthropological study of children, I do so for the reason that problems of hygiene are necessarily based on the consideration of the anatomical, physiological, and pathological conditions of masses of individuals, phenomena with which anthropological science is intimately concerned, for anthropology deals with the racial and social influences that determine form and function of the body, without reference to the peculiarities of the individual as such, although the range of variations in form and function that are found in a social group constitute a most important topic of our investigations. I wish to deprecate, therefore, at the outset all attempts at an individualistic interpretation of our results, which express only the general conditions that have to be considered in a study of the life of the individual, and which are modified in each individual by his peculiar life history and hereditary conditions that can not be expressed in our generalized results. Nevertheless, the importance of these is great, for they express in a concise way the general effects of social and racial conditions that can not be formulated in any other manner, and set definite problems to the student of hygiene as well as of anatomy and physiology.

The phenomena that interest us here are those of the development and growth of the child. The first attempt to study growth by metrical methods was made by Quetelet, in Belgium; but our first accurate knowledge is due to the investigations of Henry P. Bowditch, in Boston, and, later on, to those of Roberts, in England. These were followed by work on similar lines in America, Italy, Germany, France, Russia, and Japan. New lines of research were developed by the application of more rigid biometrical methods, the development of which we owe in large part to the influence of Francis Galton and to the work of Karl Pearson.

The results of these studies and the present status of the problem may be summarized as follows: The rate of growth of the body, measured by weight and stature, increases very rapidly until the fifth month of fetal life. From that time on the rate of growth decreases, first rapidly, then more slowly, until about four years before the age of puberty. During adolescence the rate of growth is considerably accelerated, and decreases again rapidly after sexual maturity has been reached. Thus the curve of growth represents a line which possesses a very high maximum at about the fifth month of fetal life. It decreases rapidly, and has a second although much lower maximum shortly before sexual maturity is reached, and not long afterwards reaches the zero point. The increase in bulk of the

body continues much longer than that of length. In the beginning the rates of growth of the two sexes are about equal, that of the male probably exceeding slightly that of the female. Since, however, sexual maturity begins to develop earlier in the female than in the male, the concomitant acceleration also sets in at an earlier time, with the result that for a few years girls have a larger bulk of body than boys.

Although the periods of most active growth of the parts of the body differ considerably, it would seem that the characteristics of the curve of growth as here outlined are repeated in many if not in all organs and parts of the body. For instance, although the head reaches nearly its full size at an early time, so that its rate of growth shows a much more rapid decrease with age than that of the bulk of the body, there is an acceleration of growth during the period of adolescence. The differences between the sexes are in this case quite marked in early life, the head of the girl being always considerably smaller than that of the boy. The early prepubertal acceleration of the girl is not sufficient to bring the head measurements of girls up to those of boys, even during the prepubertal period. The difference in the measurement of the sexes is, therefore, not by any means solely due to the shorter period of development of girls, as might be supposed from a study of stature and weight alone, but important secondary sexual characteristics exist in early childhood.

These prove that the difference in physiological development between the two sexes begins at a very early time, and that in the fifth year it has already reached a value of more than a year and a half.

I give here a tabular statement of the available observations:

	Age in years.		Difference.
	Boys.	Girls.	
Ossification of scaphoid	5.8	4.2	−1.6
Ossification of trapezoid	6.2	4.2	−2.0
Eruption of inner permanent incisors	7.5	7.0	+0.5
Eruption of outer permanent incisors	9.5	8.9	−0.6
Eruption of bicuspids	9.8	9.0	−0.8
Minimum increase of annual growth	10.3	8.2	−2.1
Eruption of canines	11.2	11.3	+0.1
Maximum increase of annual growth	13.2	11.2	−2.0
Eruption of second molars	13.2	12.8	−0.4
Maximum variability of stature	14.8	12.4	−2.4

These data are not very accurate and must be considered a first approximation only.

When we remember that growth depends upon physiological development, it will be recognized that we must not compare the stature of girls of a certain age with that of boys of the same age, but that from the fourth year on a girl of a certain age should be compared with a boy a year and a half older than she is.

If this view is correct, then it appears that the relation in size of the two sexes persists even in childhood.

I think no better proof can be given of the correctness of this view than the peculiar behavior of those parts of the body which complete their growth at a very early time; for instance, that of the head. The total amount of the growth of the head from the second year is very slight. If, therefore, girls are ahead of boys in their development by about a year and a half or two years, the total amount of growth of the head in their favor will be the small amount of growth accomplished during this period of a year and a half or two years. If, then, there is a typical difference between the size of the body of male and female in childhood of the same character as found in adult life, then the head of the girl ought to be at all periods smaller than the head of the boy; and this is what actually happens. The phenomenon has been interpreted as indicating a less favorable development of the head of the woman; but the previous remarks show that it is obviously due solely to the different rate of physiological development of the two sexes. The results of physiological tests which show very generally that girls do better than boys of the same age, may be another expression of the general acceleration of their development.

While we may thus speak of a curve of growth and development of the whole body and its organs, which has characteristic values for each moment in the life of the totality of individuals that compose a social group, not all the individuals pass through these stages of development with equal rapidity. It is easiest to make these conditions clear to ourselves by stating the various ages at which certain points in the physiological development of the individual are reached. Data are available for the periods of pregnancy, eruption of teeth, pubescence, sexual maturity, and development of long bones. So far as these can be reduced according to fairly accurate methods, the following results have been obtained: The average period of pregnancy is 269.4 days. One-fourth of all the children observed have been born in the periods of pregnancy between 265 and 273 days, one-half, between 260 and 278 days, and three-fourths, between 254 and 285 days. According to the laws of large numbers, the ratio of children born between any other limits of time can be determined, if any one of the pairs of values here mentioned is known; for instance, the pair which indicates the limits in which the middle half of all the children are born. In our case these limits are, accurately speaking, 269.4 days (the average), plus and minus 9 days. We may, therefore, call 9 days the measure of the variability of the period of pregnancy. I repeat that this means that one-half of all the children are born within the period limited by 269.4 days (the aver-

age), minus 9 days (i. e., 260.4 days), and plus 9 days (i. e., 278.4 days). In this way the following variabilities have been determined:

	Age (years).	Variability (years).
Pregnacy	0.0	±0.09
First incisors	.6	± .14
First molars	1.6	± .20
Inner permanent incisors, girls	7.0	±1.10
Inner permanent incisors, boys	7.5	± .90
Outer permanent incisors, girls	8.9	±1.40
Bicuspids, girls	9.0	±1.90
Outer permanent incisors, boys	9.5	±1.40
Biscuspids, boys	9.8	±1.10
Permanent canines, boys	11.2	± .90
Permanent canines, girls	11.3	± .70
Appearance of pubic hair, boys (Boas)	12.7	±1.60
Second molars, girls	12.8	±1.10
Second molars, boys	13.2	±1.30
Appearance of pubic hair, boys (Crampton)	13.4	±1.00
Full development of pubic hair, boys (Boas)	14.6	±1.10
Full development of pubic hair, boys (Crampton)	14.5	± .90
Puberty, girls	14.9	±1.30
Wisdom teeth, boys	19.3	±1.40
Wisdom teeth, girls	22.0	±1.20
Menopause	44.5	±3.90
Death due to arterial diseases, men	62.5	±8.80

It appears, from this table, which may be represented in the form of a curve, that the variability of the physiological stages of development increases very rapidly, probably so that its logarithm is in a ratio approximately proportional to the actual age, or, to use the term applied by Dr. Crampton and Prof. Rotch, to the chronological age. The causes that lead to this rapidly increasing variability are so far entirely unknown. It is certain, however, that there must be definite causes at work which bring about this phenomenon; for, if the variability were due to accidental causes only, it would increase considerably slower than in a ratio proportional to the increasing age, namely, proportional to its square root. The study of the general curve indicating the increase of variability in physiological development points to an irregularity at the time of approaching maturity. At this period the variability seems to increase at an unusually rapid rate, and either to be stationary or to decrease again at a later time.

I have spoken here of the variability of the physiological development of the body as though this were a unit. In 1895, in a discussion of Porter's observations on the growth of school children in St. Louis, I pointed out the fact that a general variability in physiological development accounts for the close correlation between the distribution of children of the same age in school grades and the variations in the size of the body and its organs; and this problem was later on worked out by myself and by Dr. Clark Wissler in regard to various measurements. These correlations have also been proved in a most interesting manner by Dr. Crampton's observations on pubescence,

and by Prof. Rotch's study of the development of the epiphyses. It is true that a close correlation between the states of the physiological development of the various parts of the body exists, but there exists also a certain amount of variability in the development of one organ when another one has reached a certain definite stage. The correlation is so close that the condition of the bones, or that of pubescence, gives us a better insight into the physiological development of the individual than his actual chronological age, and may therefore be advantageously used for the regulation of child labor and school entrance, as Prof. Rotch and Dr. Crampton advocate; but we must not commit the error of identifying physiological development with physiological age, or of considering chronological age as irrelevant.

The clearest proof that is available is found in the data relating to increase of stature, and in observations on pubescence made according to Dr. Crampton's methods. Bowditch was the first to investigate the phenomenon of growth of individuals who are short or tall at a given age, but his method was based on a statistical error. Later on, I showed that retarded individuals possess a late acceleration of growth, and these results were amplified by studies made by Dr. Beyer and Dr. Wissler. Recently I had occasion to make a more detailed statistical analysis of the phenomenon of growth, which shows that individuals whose prepubertal accelerated growth begins late in life have rates of growth that exceed by far those of the normal individual; in other words, that, among the retarded individuals, the whole energy required for growth is expended in a very brief period. In the case of stature, the phenomenon is complicated by the great differences in hereditary stature among the various parts of the population. It appears more clearly in observations on pubescence. Thus it can be shown that, if the first pubic hair appears in one group of boys at 11½ years, and in another at 15½ years, it will take the former much longer than the latter to attain the full development of pubic hair, and the rate of change found among them will be much greater than that of normally developed individuals. In other words, individuals who exhibit the same stages of physiological development are not the same, physiologically speaking, if their actual chronological ages differ; their past is not the same, and prospective physiological changes in their bodies will proceed in different ways. It is clear, therefore, that the greater the retardation or acceleration in any one particular respect, the greater will also be the disharmonies that develop in the body, since not all the other organs will follow the same rate of acceleration and retardation. The causes of these phenomena are unknown, but we may perhaps venture on the hypothetical explanation that all the cells of the body undergo certain progressive changes with increasing age, and that

the internal secretions which become active at the time of puberty exert a stimulus upon the cells which causes accelerated growth in the cells, which depends, however, also upon the state of development of those cells. This may refer to the whole body, as well as to the glands that have a direct influence upon the rate of growth. In retarded individuals many of the cells have advanced in their development more nearly normally than the groups of cells involved in sexual maturity; and when their action sets in the cells of the body are stimulated much more vigorously than the less developed ones of an individual that reaches maturity at an earlier time. This hypothesis, however, would have to be tested experimentally. It is intended only to bring nearer to our understanding the complicated phenomena of retarded and accelerated growth.

It seems very likely that the abnormally large amount of energy expended upon rapid growth during a short period is an unfavorable element in the individual development. A study of the phenomena of growth of various groups of the same population has shown that early development is a concomitant of economic well-being, and that for the poor the general retardation in early childhood and the later rapid growth are characteristic. It follows from this that there is a corresponding, although not equal, retardation in early mental development, and a crowding of developmental processes later on that probably place a considerable burden on the body and mind of the poor which the well fed and cared for do not suffer. The general laws of growth also show that a retardation kept up for an unduly long period can not be made up in the short period of rapid growth; so that it would seem that, on the whole, excessive retardation is an unfavorable element in the growth and development of the individual. Whether there are similar disadvantages in a considerable amount of early acceleration is not so clear.

A word may also be said in regard to the evident increase in the general statures of the people of Europe, which has been proved by the study of military statistics. I presume this is partly due to better nutrition and earlier development, but it seems likely that much of it may be due to the better control of infantile diseases, which exert a long retarding influence upon the growth during the earlier years of childhood.

When we turn from the more general phenomena of growth to a consideration of their controlling causes, particularly of the influences of heridity and of environment, we have to confess our ignorance of the most elementary facts. While there is no doubt that the bodily size of the parents determines to a certain extent the growth of the bulk of the body of the children, it is not by any means clear in how far part of this may be due to the controlling effect of environmental causes to which parents and their children are equally

subject. It is quite obvious that the earlier in fetal life certain traits are formed, and the earlier they reach their full development, the stronger will be the heriditary influence; while the later in life the full development is attained the greater will be the influence of environment, not only on account of the longer time of its action but also owing to the greater diversity of its form. Thus, if the anterior part of the palate has very nearly reached its final form and size in the sixth year no amount of subsequent change of food or use will materially influence its form; while weight and stature, and, even more, mental development, will be modified by the influences to which the individual is subject during the first two or three decades of his life. The problem of growth must, therefore, be studied for every organ independently.

Some observations have been made that illustrate the influence of environment, not only upon growth of the bulk of the body but also upon some of the forms that develop very early in life. Thus, it has been shown that urban and rural populations in Europe exhibit characteristic differences in size and form of the head. These differences are slight, and the attempt has been made to explain them as due to selection or mixture; but reasons can be brought forward that suggest other causes for the modification of the bodily forms. It has also been observed that a fairly homogeneous people like the east European Jews develop distinctive forms in the different parts of Europe that they inhabit, and that Italians, Bohemians, and Jews who come to America develop distinctive characteristics. Whatever the causes of these changes may be, whether due to selection or to internal changes brought about by the new environment, they indicate that heredity is not the sole factor that determines the development of the body.

The few observations which we possess on the growth of children of different races seem to show that there are definite characteristics of the growth curve for each group. Thus, Indian children seem to be shorter than European children, while the adult Indian is as tall as or taller than the European; but it is impossible to tell in how far this is due to the mode of life and how far to the influences of heredity. It is not too much to say that all the work on these problems remains to be done. Our ignorance of these facts should make us hesitate to judge rashly of the mental and bodily inferiority or superiority of races, since the data for forming a judgment are entirely lacking, and since most of the features on which we are accustomed to form our judgment develop late in life, and are therefore, as explained before, to a great extent subject to the influence of environment.

Related to these questions is the problem of the period of development of racial traits. At a very early stage of development chil-

dren of all races are much alike, and many of the most characteristic traits do not develop until maturity is reached. Traces of these racial traits may be observed at an early time, but their accentuation occurs comparatively late. Here we have undoubtedly traits that are determined by a long line of ancestors, not by environment. Thus, parts of the body that are alike in childhood are subject to a more active growth in one race than in another. For instance, the elevation of the nose of the European, the prominence of the face of the negro, the great length of the leg of the negro, the great width of face of the Mongol and Indian are due to a marked growth of these features. Others, on the other hand, lag behind. Thus we are confronted with the ontogenetic problem of the origin of the diversity of human types, and of the oft claimed but never proved phenomena of early arrest of development in certain groups.

On the whole, what little we know would indicate that the periods of growth are the same everywhere, but that the rate of growth is throughout proportionally greater in one group than in another, and that in this manner the racial characteristics are developed. Too little is known, however, to express any definite opinion on this important subject.

The subject is one that, in its general aspects, as well as in the questions relating to the influence of heredity and environment, has a direct bearing upon questions of social well-being and upon our estimate of racial characteristics, and for this reason deserves systematic study, not only for the sake of its scientific interest but also on account of its practical importance.

PHYSICAL EFFICIENCY TESTS DURING ADOLESCENCE.

J. H. McCurdy, A. M., M. D., M. P. E., Director Teachers' Courses in Physical Education, International Y. M. C. A. College, Springfield, Mass.

This paper can serve only as a preliminary statement and illustration of a method of study. The writer began the heart-rate and blood-pressure section of the study at Clark University in the fall of 1908. While a graduate student in the university personal observations of the Worcester, Mass., schoolboys, grammar and high, were taken. The study has been continued during the last four years with the aid of the following students from the International Young Men's Christian Association College: Messrs. Brock, Fette, and Yeager, 1910; Dittemore, Courleux, and Martin, 1911; and Deaver, Doane, Metzler, and Samson, 1912. Observations were made under the supervision of the writer on the Springfield, Mass., high-school boys.

The items studied were heart rate and blood pressure, pubescence, height, weight, strength, lung capacity, and scholarship. In both cities the cooperation of the school officials made the study possible. The method of generalized study was, after the first year's study, discarded in favor of the individualizing method, since it was found that the generalizing method gave no evidence of an abrupt pubertal rise of blood pressure as stated by Hall[1] in his adolescence and Tyler[2] in his growth and education. The aim of the study during the past three years has been to follow the same boys during the period of adolescence, with at least two examinations a year, rather than examining them for only one year. The generalizing method assumes that the boys who are, for example, 12 years old this year will be like the boys 13 years old a year from date. This method has been quite largely used. Dr. Bowditch,[3] in his study of the Boston school children, and Dr. Porter,[4] in his study of the St. Louis children, are well-known examples. The individualizing method follows the same boys during this period of maturing. This method has been followed by Crampton,[5] in his study of the New York City school children. Crampton's study indicates that there is a wide difference in boys of the same chronological age.

The aim of my investigation is an attempt to discover the way boys mature, and to relate that knowledge to methods of promoting their health and efficiency in school and in life. We should have norms of vigor which would give a fair index of the health and efficiency of the individual boy or girl. The school gives an index of the intellectual efficiency of the boy for these particular tasks. We have at present no common indices of vigor which are generally accepted. This study is an attempt to find such indices. It is, I think, the first attempt which has been made to correlate the factors of efficiency in the adolescent boy. The marks given in physical education practice are probably a closer index of motor efficiency than are the marks given in the classroom of intellectual efficiency, but they have not received such general acceptance. We need two new sets of indices:

First, indices of the intellectual health, organic soundness, and efficiency of the central nervous system.

Second, indices of organic efficiency. It has been generally recognized that the modern environment has affected unfavorably the health of the city dweller, if not that of one living in country places. While it is true that infectious diseases have decreased, it is also true that diseases of the nervous system, of the heart, and of the kidneys have increased. The environment and activities of children have markedly changed. First, they learn by going to school rather than by aiding their parents in their activities. Second, they use chiefly the highly specialized muscles used in speaking, writing, and close

vision, rather than the large muscles of the legs and trunk. School education has increased the use of the accessory muscles and decreased the use of the fundamental muscles.

Third, the central nervous system is asked to function chiefly in its higher activities rather than in organic work.

On the basis of Hughlings Jackson's[7] three-level theory, which seems to be meeting with general acceptance by psychologists, we have—

(*a*) A lower or organic level controlling circulation, respiration, and nutrition, largely through the plain muscles and organic nervous centers, e. g., cardiac and respiratory.

(*b*) A middle level, which might be called the motor and sensory level. This is most nearly illustrated by Flexig's motor and sensory region.

(*c*) A highest level, represented in a general way by the association areas, which are still more complex and related to the higher intellectual processes and to moral judgments.

We recognize that the development of the higher centers are dependent on the proper development of the lower centers; that the health of the body is essential to the health of the central nervous system; but we often fail to see how intimate the relationship really is.

Centers for the simplest movement of the limbs become evolved, in the higher centers, into the physical basis of volition, centers for simple reflex actions of eyes and hands are evolved, in the higher centers, into the physical basis of visual and tactual ideas. The low-level centers governing the tongue, palate, and lips in eating and swallowing are evolved, in the higher centers, into the physical basis of word symbols serving us during abstract reasoning.

The lowest level centers, which control respiration, circulation, and nutrition, are evolved, in the higher centers, into the physical basis of the emotions.

The low-level or basal centers regulate the organic life, the high-level centers are related to the intellectual and emotional life.

The higher centers are built upon the lower ones. Intelligence and morality are related to the physical integrity of the lower centers.

In searching for indices of vigor, I have selected items which represent large organic efficiency in relation to maturity. The chief factors in physical efficiency are good organs, a stable nervous system, and a good environment.

I have taken the pubescent index, as outlined by Godin,[8] Marro,[9] and Crampton,[5] as the method of determining maturity. I have used the specific method of Crampton, whose three divisions seem more accurate than those of Godin or Marro. Crampton divides the maturing boys into P_1, prepubescents, those without visible hair on the pubes; P_2, pubescents, those upon whom has appeared a fine

growth of pubic hair, with pigmentation; P_3, postpubescents, those who have the kink or twist of the pigmented hair. Godin gives the best description of the changes coincident with the appearance of puberty. Marro should be consulted in relation to the causes which retard or accelerate the appearance of puberty, such as climate, temperature, race, and hygienic conditions.

In the height and weight studies, 212 boys were examined. Fifty-one of these were examined five times between October, 1910, and March, 1912. The rest of the boys were examined in October, 1911, and March, 1912. The following tables show the growth rates:

Growth rates.

OCTOBER, 1910–MARCH, 1912; ONE YEAR FIVE MONTHS.

	Average gains 51 boys.	
	Height.	Weight.
	Inches.	*Pounds.*
Prepubescents (Doane, p. 24)	2.8	8.55
Pubescents (Doane, p. 26)	4.46	23.03

OCTOBER, 1911–MARCH, 1912; FIVE MONTHS.

	Average gains 212 boys.	
	Height.	Weight.
	Inches.	*Pounds.*
Prepubescents (Doane, p. 68)	0.73	5.45
Prepubescents changing to pubescents (Doane, p. 68)	1.25	6.92
Prepubescents changing to postpubescents (Doane, p. 68)	1.35	8.52
Pubescents (Doane, p. 59)	1.35	8.38
Pubescents changing to postpubescents (Doane, p. 62)	1.27	7.82
Postpubescents (Doane, p. 63)	1.04	6.6

There is a rapid increase in height and weight during the maturing period, with a gradual decline in rate after the maturing period.

The lung-capacity studies show similar gains due to the degree and rate of maturing. Examinations were made of 179 boys, with 57 of these carried over from 1910.

Lung capacity.

OCTOBER, 1910–MARCH, 1912; ONE YEAR FIVE MONTHS.

	Average gains 57 boys.		
	October, 1910.	March, 1912.	Differences.
	Cubic in.	*Cubic in.*	*Cubic in.*
Prepubescents (Deaver, p. 68)	125	136.6	+11.6
Prepubescents changing to pubescents (Deaver, p. 65)	145	177	+32
Pubescents changing to postpubescents (Deaver, p. 66)	141	181.1	+40.1
Pubescents changing to postpubescents (Deaver, p. 67)	173	218	+45

The following strength-test table gives the differences between groups:

Strength tests (grip), pounds.

	Forearms.				Shoulder retractors.	
	Right.	Difference.	Left.	Difference.		Difference.
Prepubescents	50.3–56.6	+ 6.3	42.3–49	+ 6.7	27.7–36.6	+ 8.9
Prepubescents changing to pubescents	53.3–64.8	+11.5	49.9–56.8	+ 6.9	34.8–39.5	+ 4.7
Prepubescents changing to postpubescents	54.3–69.6	+15.3	52 –61	+ 9	34 –42.3	+ 8.3
Pubescents changing to postpubescents	73.6–88.8	+15.2	65 –85	+20	46.4–57.3	+ 10.9

The pubertal changes are more rapid in summer. With this change comes a more rapid increase in lung capacity and probably in height, weight, and strength. In lung capacity, e. g., if a boy changes from one period to another during the winter months, he will increase his lung capacity 10 to 14 cubic inches.

If he changes during the summer he will increase 20 to 28 cubic inches. It would be interesting to compare boys who spend their summers largely out of doors and those spending theirs indoors.

The heart rate and blood pressure studies have been continued for four years, 1908 to 1912. The following tables indicate the results of this study (Samson, p. 37):

Heart rate.

Year.	Prepubescents.		Pubescents.		Postpubescents.	
	Horizontal.	Vertical.	Horizontal.	Vertical.	Horizontal.	Vertical.
1908–9	77	84.8	70	75.5	67.5	83.2
1909–10	82.9	85.3	82.2	89.6	80.2	87
1910–11	80.9	90.7	83.1	94.1	81.4	92.6
1911–12:						
Tech	72.2	82.8	77.4	90.5	76.4	91.4
Cent	82.6	92	71.8	87.8	74.8	89.2

The examinations were conducted with great care. The location of the examining room reduced to a minimum the amount of exercise needed to get to the place for examination. Pupils were selected who had been seated in the classroom for at least an hour. Where there was any indication of accelerated heart action, from exercise or from nervousness, the pupil reclined for three or four minutes or until all evidence of acceleration had had time to disappear. The high heart rates which persisted were sometimes due to nervousness and sometimes to anemia or general low vitality. Variability was markedly greater in the pubescents and postpubescents, that is, during the

period of rapid change. High heart rates seemed to indicate poor condition. Heart rates with wide variations between the horizontal and standing positions seem indicative of poor vascular adjustment.

In the Worcester group, the writer was fortunate in having several distinct types of boys to study.

(A) *Paper-route boys.*—These boys covered from 3 to 9 miles each day delivering papers, most of them before 7 a. m. They had lower heart rates than the average of their groups.

Heart rate of paper-route boys.

	Horizontal.	Standing.	General average.	
			Horizontal.	Standing.
P_1, P_2, P_3	63.5	75.2	68.6	84.7
P_3	60.7	71.3	65.9	82.1

The difference between the horizontal position and the standing position of the P_1, P_2, P_3 general-average boys was 16.1, of the paper-route boys it was 11.7. Of the P_3 general boys the difference was 16.2; of the paper-route boys, 10.6.

(B) *Athletic boys.*

	Horizontal.	Standing.	General average.	
			Horizontal.	Standing.
P_3	61.5	78.3	65.9	82.3

The difference in the general average was 16.2; of the athletic boys, 16.8.

(C) *Rapid growers.*—These boys grew in height from 1 to 3.1 centimeters in 10 weeks. They show the following relations to the other groups:

Heart rate over 80 beats per minute.

	Horizontal.	Standing.
	Per cent.	*Per cent.*
Rapid growers	30	90
Prepubescents	33	68
Pubescents	26	75
Postpubescents: All below 80		55

The rapid growers have, on the whole, the highest heart rate.

The systolic blood-pressure studies conformed to the same conditions as those for the heart rate mentioned above (Samson, p. 38):

Year.	Prepubescents.		Pubescents.		Postpubescents.	
	Horizontal.	Standing.	Horizontal.	Standing.	Horizontal.	Standing.
1908–9	103.6	104.3	110.5	110.8	110.3	109.5
1909–10	111.4	112.7	121.1	120.0	123.0	121.1
1910–11	110.9	111.2	120.5	117.8	126.1	125.4
1911–12 Tech.	106.0	107.7	106.6	108.7	110.2	111.06
1911–12 Cent.	106.6	110.3	109.2	116.7	116.3	122.4

The smallest range of difference is shown in the prepubescents. The pressure rises slightly in both the horizontal and vertical positions with the gradual maturing of the boy.

Low pressures (below 100) indicate a weak heart, weak peripheral resistance, or lack of splanchnic adjustment. The fall in pressure on changing from a horizontal to a standing position, probably means lack of cardio-vascular adjustment (vaso-motor tone). Low pressures (below 100) indicate lack of vigor. In high pressure (above 130), the examiner should find whether the kidneys are causing the high pressure. There is no evidence of an abrupt pubertal rise in blood pressure as stated by Hall [1] and Tyler.[2] With the wide blood pressure variations in prepubescents 78 to 120 millimeters Hg., in pubescents 78 to 152 millimeters Hg., in postpubescents 76 to 136 millimeters Hg., it seems necessary to conduct a series of experiments on the same boys for a series of years which shall follow their blood pressure changes through the entire period from immaturity to maturity. This summary represents four years of such study. The accumulation of data is slow, because a portion of the boys begin their maturing in the grammar school. This increases proportionately the number of pubescents and postpubescents in the high school.

The pressures of the prepubescents, pubescents, and postpubescents range over the same general field, with the tendency to the lowest pressures in the prepubescents, and the highest in the postpubescents. Experiments should be taken at intervals short enough to determine whether there is a rapid rise at any time, and, if such a rise occurs, whether it is in relation to pubescence.

Scholarship in relation to pubescence.

	Average grades.
Prepubescents, freshmen	75.1
Pubescents, freshmen	70.8
Postpubescents, freshmen	74.7

These average grades exclude the failures. The following table gives the percentage of failures in each subject:

Percentage of subjects failed in each period.

	Prepubescents.		Pubescents.		Postpubescents.	
	Number examined.	Per cent failed.	Number examined.	Per cent failed.	Number examined.	Per cent failed.
English	46	1.7	52	13.4	27	29.6
Mathematics	47	1.6	51	17.6	28	42.8
Science	29	0	23	13.4	28	12.5
History	46	0	50	12	28	0
Language	22	22.7	31	40	17	41.1
Total	190 (7)	3.6	207 (39)	19	128 (28)	22

	Total subject units.	Total failures.	Per cent failures.
Prepubescents	190	7	3.6
Pubescents	207	39	19
Postpubescents	128	28	22

Of those securing passing grades, the pubescents, or those maturing most rapidly, had the lowest grades. Among those who failed, there was a progressive increase in the number of subjects in which they failed. This was probably due to the duller boys being left behind, while the brighter boys were advanced to second-year work. The boys failed more often in English, mathematics, and language.

CONCLUSIONS.

The most obvious needs are for standards of growth and efficiency which are related to the maturity of the boy rather than to his chronological age. An illustration from Deaver's work will make clear in a graphic way the difference between chronological and physiological age in relation to strength and lung capacity. The table shows the increases for approximately the same period.

Differences between chronological and physiological age in regard to strength and lung capacity.

Chronological age.	Physiological age.	Right forearm.	Left forearm.	Shoulder retractors.	Lung capacity.
13 years 4 months	P_1	46	36	24	130
14 years 10 months	P_2	80	68	58	190
14 years 5 months	P_1	45	37	24	110
15 years 10 months	P_1	50	45	30	125

The younger boy is far ahead of the older boy in maturity and physical efficiency.

We have no accepted standards of growth and efficiency, nor can we have them until growth studies have been followed through with the same boys consecutively during the entire period of maturing.

We need at least the following standards:

1. Normal standards in height and weight which are related to maturity. Crampton[5] has shown that chronological age is not as good a basis for the study of height and weight as physiological age.

2. The work of the last four years has not completely disproved the commonly accepted pubertal rise in blood pressure, as stated by Hall[1] and Tyler.[2] It is fair to say, however, that the evidence points away from any abrupt pubertal rise. The nonappearance of the rise which one would expect to come with the rapid increase in heart size in relation to the size of the arteries is probably explained by the peripheral dilation of the small arteries, which keep down the pressure.

3. The present study points toward two conclusions in relation to scholarship:

(*a*) A lower grade in pubescent freshmen than in the prepubescent or postpubescent freshmen, for those who pass in their studies.

(*b*) With those who fail, there seems to be a progressive increase of failures from the prepubescents to the postpubescents, probably due to the leaving over of the pubescent and postpubescent failures from other years.

BIBLIOGRAPHY.

1. Hall. Adolescence. Vols. 1 and 11, p. 93. Vol. 1, D. Appleton & Co., N. Y., 1905.
2. Tyler. Growth and Education, pp. 80, 180. Houghton, Mifflin Co., Boston, 1907.
3. Bowditch. Growth of Children. Annual Report Massachusetts Board of Health. Boston, 1877, Vol. VIII, pp. 275–325.
4. Porter. The Relation between the Growth of Children and Their Deviation from the Physical Type of Their Sex and Age. Transactions of the Academy of Science of St. Louis. Vol. 10: 233–250 (1894).
5. Crampton. Physiological Age. American Physical Education Review, March–June, 1908.
6. Hughling's Jackson's. The Three Level Theory, Journal Mental Science, 1887–88, Vol. XXXIII, pp. 25–28.
7. Godin. Recherches anthropométriques sur la Croissance, Paris, A. Maloine, editeur, 1903, pp. 180–197.
8. Marro. La Puberté. Paris Libraire, C. Reinwald Schleicher Frères, éditeurs, 1902, pp. 530.
9. McCurdy. Adolescent Changes in Heart Rate and Blood Pressure. American Physical Education Review. June, 1910.

THE ESTHESIOMETRIC METHOD, MEASURING FATIGUE, IN THE LIGHT OF THE LOGARITHMIC METHOD OF DR. AMÉLINE.[1]

Dr. M. C. SCHUYTEN, Antwerp.

Those who are interested in the important problem of measurement of fatigue and followed the researches and debates on that matter, will still remember how the esthesiometric method was attacked and till what degree it is still the object of a coolness which his defenders were not able to combat. Now Dr. Ameline has found in my long esthesiometric determinations upon Antwerp school children[2] a logarithmic formula which was also applied to other biological phenomena. He comes to the conclusion that fatigue is a natural phenomenon only, and my overburdenings theory not based upon solid grounds.

To build up the known general logarithmic formula, Ameline takes a given group of results, for example, the group of backward children, right cheek, expressed in tenths of millimeters, and seeks in the plotted curve a maximum A which has, of course, a theoretical value only. He found here 280. Then he determines, by a series of subtractions (280 minus the successive values of fatigue), the mean mental energies during the successive months and a ratio to correct these rests, which are again subtracted from A and the results compared with the original experimental data. An example will illustrate the method:

Months.	October (No. 1).	November (No. 2).	December (No. 3).	January (No. 4).	February (No. 5).	March (No. 6).
E [a] (fatigue) found	147	170	187	195	213	225
280-E (mental energy)	133	110	93	85	67	55
280-E calc. (R=1, 183)	130	110	92,9	78,5	66,7	56
E calculated	150	170	187,1	201,5	213,7	224

[a] E or Écart, the distances between the points of the esthesiometer.

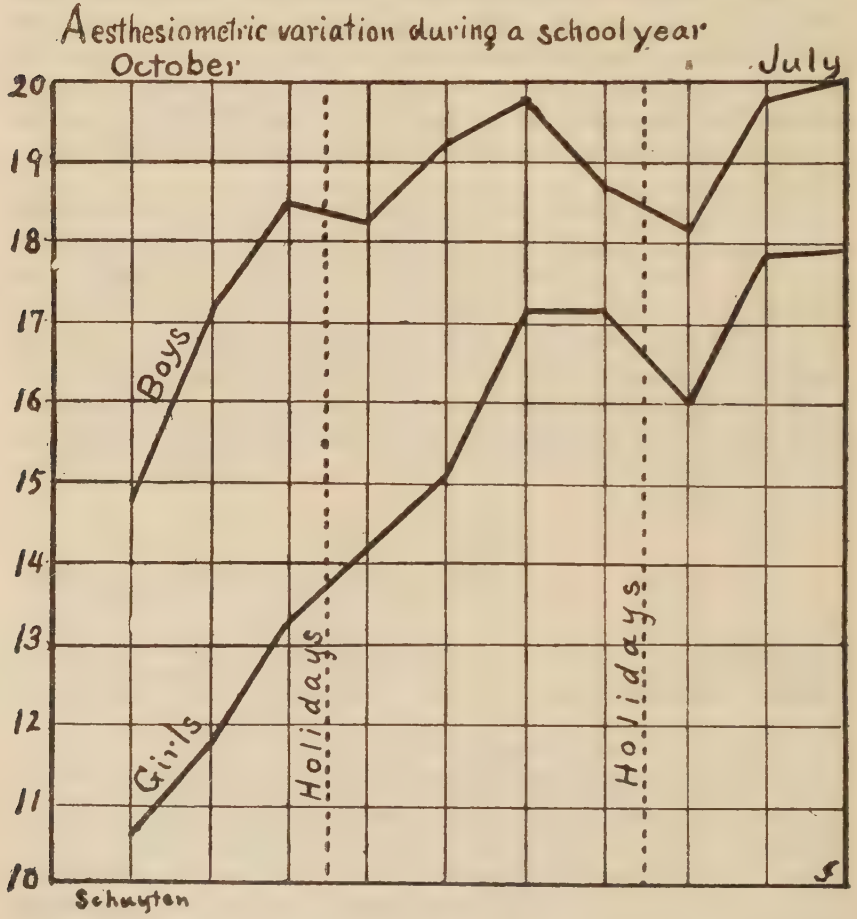
Giving up January, which might give, according to the holidays, an interruption in the regular development of the curve, the greatest difference found in the determined and calculated values is three-tenths of a millimeter. Therefore, it is sure that the geometrical series is established. In all my series the same result is mathematically obtained with regularity. The deductive equation is

$$0{,}168\ t = 5{,}033 - \log.\ \text{nep}\ (280 - E)$$

0,168 being the Neperian log. of the R=1,183; t the time (distances between the successive months), and 5,033 a constant which is the log. of A—E for the month 0 (September, not determined). It is only the general logarithmic formula

$$A - E = bc^{-et}$$

well known, in which e is the basis of the natural log. and A, b, and c to determine constants. The law is stated: The normal cerebral fatigue develops itself in a geometrical series, when the agreeing time is an arithemetical one. The conclusion is this: It is not possible to discover a mathematical law in a series of experiments when these are not accurately established, i. e., in nature exactly read; inversely a series of experiments are surely well executed when they conduct to a



known mathematic law or formula. It is impossible to obtain that result if the employed method is not accurate. Thus the esthesiometric method is a valuable one for fatigue measurements. I conclude that the discussions about validity of esthesiometric results are closed. All the results obtained, tending to discredit the esthesiometer, are due to insufficient accuracy in the methods employed.

Now, my response to Ameline about his notion on overburdening. It will be very short, but conclusive enough, I think.

Acording to the views of this author, overburdening will be observed when on a given moment the logarithmic curve disappears and becomes an irregular line. The "natural" phenomenon can never be the expression of broken equilibrium. Overburdening here has thus the signification of pathologic state. And, if the general energy becomes slow and goes back, never mind—"la fonction fait l'organe." The different modified functions will draw up new appropriated organs. That is very true, but what is then the need for propagation of hygienic rules? Or, is it not better, necessarily, to modify all the organs in the way of better and more complete general transaction? I think yes! And each time I observe—for example with the esthesiometer, as I did, that fatigue, instead of disappearing during a school year, increases, with a ratio R as I found (see the figure), I conclude to overburdening, also when the organic state does not become pathologic in the sense of logarithmic calculation. And the degree of overburdening will depend on the value of the successive ordinates in the curve. If it is inevitable and natural that a given biological phenomenon, repeated in the same manner, becomes, during a variable long time, a horizontal line—theoretical, the ideal state—then it remains, however, always necessary to conduct it so that the reason R, in the case of mental fatigue in school children, is as small as possible.

I consider Ameline's mathematical work an important discovery, leading to a modified, more exact comprehension of mental school phenomena. It appeared in the psychological literature two years ago. Why did it not create more interest in the hygienic and pedagogic world? I can not explain!

---

[1] Journ. de Psychol. norm. et pathol. 1911. (Alcan, Paris.)

[2] Paedologisch Jaarboek. 6, 1906–7. (Nederlandsche Boekhandel, Antwerpen.)

MORTALIDAD INFANTIL EN LA REPÚBLICA DEL URUGUAY EN EL DECENIO 1901–1910.

Dr. Julio A. Bauzá, director del Consultorio Gota de Leche No. 1.

CONSIDERACIONES GENERALES.

El Uruguay constituye un país cuya independencia data sólo de 80 años. Su poblición está constituída exclusivamente por descendientes de Europeos y alcanza á 1,250,000 habitantes, repartidos en una extensión territorial de 187,000 kilómetros cuadrados. De esta población, unos 350,000 habitan en Montevideo, estando el resto distribuído en los campos ó en ciudades de menor importancia. Por su situación geográfica entre los paralelos 30 y 35 de latitud sur y sus costas al Océano Atlántico y al Estuario del Plata, así como por

su topografía, su clima es benigno, observándose muy raramente que su temperatura baje de 0° en invierno ó suba de 30° ó 32° en verano, siendo su temperatura media en las distintas estaciones del año como sigue: En el quinquenio 1901–1905—verano, 21.5; otoño, 14.7; invierno, 11.6; primavera, 18.1. Promedio del quinquenio, 16.5. Siendo la inmensa mayoría de su población de origen latino, se comprende que sus costumbres son casi idénticas á las de los países europeos de la misma raza. La nupcialidad es de 7.59 por 1,000 en 1910, y la natalidad de 32 por 1,000 representa un coeficiente bastante alto, como puede verse observando la situación del Uruguay al lado de otros países.

Las mujeres han heredado de sus progenitores la sana costumbre, y la aptitud de criar á sus hijos á pecho, el mayor tiempo posible y esto no sólo se observa en la clase pobre, sino también en las clases elevadas. La moda europea de la alimentación artificial, por motivos de orden social, no ha entrado aún entre nosotros. No quiere decir esto que la alimentación artificial sea exepcional en los primeros meses de la vida, sino simplemente que no se encuentra tan generalizada como en los países europeos, como en Alemania y Francia; es posible darse cuenta del grado de extensión de la alimentación á pecho, en la clase pobre; observando el siguiente cuadro que se refiere á niños inscriptos en el Consultorio "Gota de Leche No. 1."

De 1,000 niños inscriptos en los años 1909 y 1910, encontramos que sólo 26 no tomaron nada de pecho. Por lo tanto el 97.4 por ciento de las madres inscriptas han podido ellas mismas amamantar mas ó menos tiempo total ó parcialmente á sus hijos; 54 de ellas sólo pudieron criar de varios días á un mes; es decir, que 920 sobre 1,000, ó sea 92 por ciento, han podido amamantar más de un mes á sus pequeños; 873 lo han hecho más de dos meses; 804 más de tres; 728 más de cuatro; 640 más de cinco; 567 más de siete meses. Es decir, que el 56.7 por ciento de las madres pobres han amamantado á sus hijos más de seis meses á pecho; 449 más de siete meses; 376 más de 8 meses; 314 más de 9 meses; 232 más de 10 meses. Más de 1 año sólo 119; esto es, 11.9 por ciento; 60 más de 14 meses; 26 más de 16, y sólo 3 más de 20 meses.

Como se vé, la aptitud de poder criar á sus hijos falta muy rara vez, y puede asegurarse que por lo menos el 92 por ciento de las madres pueden criar total ó parcialmente á pecho á sus hijos durante los 2 ó 3 primeros meses de la vida.

1.

LA MORTALIDAD INFANTIL EN RELACIÓN CON LA NATALIDAD, EN LA REPÚBLICA Y EN LOS DEPARTAMENTOS—ESTUDIO COMPARATIVO CON OTROS PAISES Y CIUDADES.

El alto coeficiente de natalidad, 32 por 1,000, que ofrece el Uruguay y un bajo cociente de mortalidad, 14.5, hacen que nuestro país tenga

fama universal como sano, y que se haya mirado sino con indiferencia, por lo menos con poca atención, mucho de cuanto se relacione con el mejoramiento de la salud pública, que si no empeora, tampoco mejora como sucede hoy en casi todos los países civilizados, en los cuales se hacen toda clase de sacrificios para disminuir el coeficiente de mortalidad general y más especialmente el referente á la mortalidad infantil. Se dirá que entre nosotros no existe la cuestión de la mortalidad infantil, elevada en muchos países Europeos y Sud-Americanos. Pero nosotros probaremos con la elocuencia de las cifras que aunque no en tal alto grado como en Chile, Alemania, Austria, Rusia y Francia, existe entre nosotros dicho problema y merece dedicarle especial atención. Si bien tomando en conjunto los nacimientos 36,000 y las defunciones 3,600, resulta un coeficiente de 10 defunciones de menores de un año por 100 nacimientos, veremos en los cuadros siguientes las oscilaciones correspondientes á distintos años y sobre todo las diferencias que ofrecen los distintos Departamentos que constituyen la República.

CUADRO No. 1.

La mortalidad infantil (menores de 1 año) en toda la República, relacionada con la natalidad.

QUINQUENIO 1901–1905.

Años.	Nacimientos.	Defunciones.	Defunciones por 100 nacimientos.
1901	31,703	3,235	10.2
1902	31,526	3,358	10.6
1903	32,600	3,557	10.9
1904	26,984	2,398	8.9
1905	33,709	2,775	8.2

Promedio de defunciones (menores de 1 año) por 100 nacimientos, en 1901–1905, 9.7 por ciento.

QUINQUENIO 1906–1910.

Años.	Nacimientos.	Dfunciones.	Defunciones por 100 nacimientos.
1906	32,578	3,558	10.9
1907	33,657	3,662	10.8
1908	35,520	3,574	10
1909	35,663	3,583	10
1910	35,927	3,978	11

Promedio de defunciones (menores de 1 año) por 100 nacimientos, en 1906–1910, 10.6 por ciento.

Como puede verse, el coeficiente de mortalidad del Uruguay, que en el quinquenio 1901–1905, ofrece un promedio de 9.7 por 100 anual, en el período siguiente se eleva á 10.6 por 100; es decir, señala

un aumento de 0.9 por 100, dando precisamente el año 1910 la cifra más elevada del decenio, 11 por 100.

Si separamos á Montevideo del resto del país y estudiamos comparativamente en los dos quinquenios, las cifras correspondientes á la capital y á la campaña, observaremos que mientras en Montevideo la mortalidad infantil media anual es casi la misma en los períodos 1901–1905 y 1906–1910, el promedio de cada período en la campaña demuestra un aumento de 1.3 por ciento, siendo los promedios, 9.3 en 1901–1905 y 10.6 en 1906–1910; manteniéndose, sin embargo, á una altura menor que en Montevideo. Los cuadros siguientes son bien ilustrativos al respecto:

CUADRO No. 2.

La mortalidad infantil en Montevideo, relacionada con la natalidad en el decenio 1901–1910.

A Años.	B Nacimientos.	C Defunciones de menores de 1 año.	$\frac{100\,c}{b}$ Defunciones por 100 nacimientos.
1901	7,824	963	12.
1902	7,834	931	11.8
1903	8,080	965	11.9
1904	7,702	737	9.5
1905	7,709	776	10.7
	39,149	4,372	11.2
1906	7,980	899	11.2
1907	8,356	887	10.6
1908	8,819	863	10.1
1909	9,363	1,009	10.7
1910	9,486	1,199	12.6
	44,004	4,857	11

Promedio de defunciones por 100 nacimientos, en el quinquenio 1901–1905, 11.2 por ciento.
Promedio de defunciones por 100 nacimientos, en el quinquenio 1906–1910, 11 por ciento.

CUADRO No. 3.

La mortalidad infantil en toda la República, excluído Montevideo, relacionada con la natalidad.

QUINQUENIO 1901–1905.

Año.	Nacimientos.	Defunciones de 0 á 1 año.	Defunciones por 100 nacimientos.
1901	23,879	2,272	9.5
1902	23,692	2,427	10.2
1903	24,520	2,592	10.5
1904	19,282	1,661	8.6
1905	26,000	1,999	7.6

Promedio del quinquenio 1901–1905, 9.3 por ciento.

La mortalidad infantil en toda la (República, excluído Montevideo, relacionada con la natalidad—Continúa.

QUINQUENIO 1906–1910.

Año.	Nacimientos.	Defunciones de 0 á 1 año.	Defunciones por 100 nacimientos.
1906	24,598	2,659	10.8
1907	23,301	2,775	10.9
1908	26,701	2,711	10.5
1909	26,300	2,574	9.7
1910	26,441	2,779	11.

Promedio del quinquenio 1909–1910, 10.6 por ciento.

Si observamos aisladamente cada uno de los Departamentos que constituyen la República, observaremos como puede verse en los mapas adjuntos, que en el quinquenio 1901–1906, Artigas es el Departamento que ofrece una mortalidad infantil más elevada, 15.8 por 100 nacimientos, casi el doble de la de Canelones, 8 por ciento. Al lado del primero y en orden decreciente siguen Salto, Soriano, Rivera, Tacuarembó, Cerro-Largo, Durazno, Paysandú, Flores, Montevideo, Río Negro, San José, Minas, Florida, Colonia, Maldonado, Treinta y Tres, Rocha y Canelones.

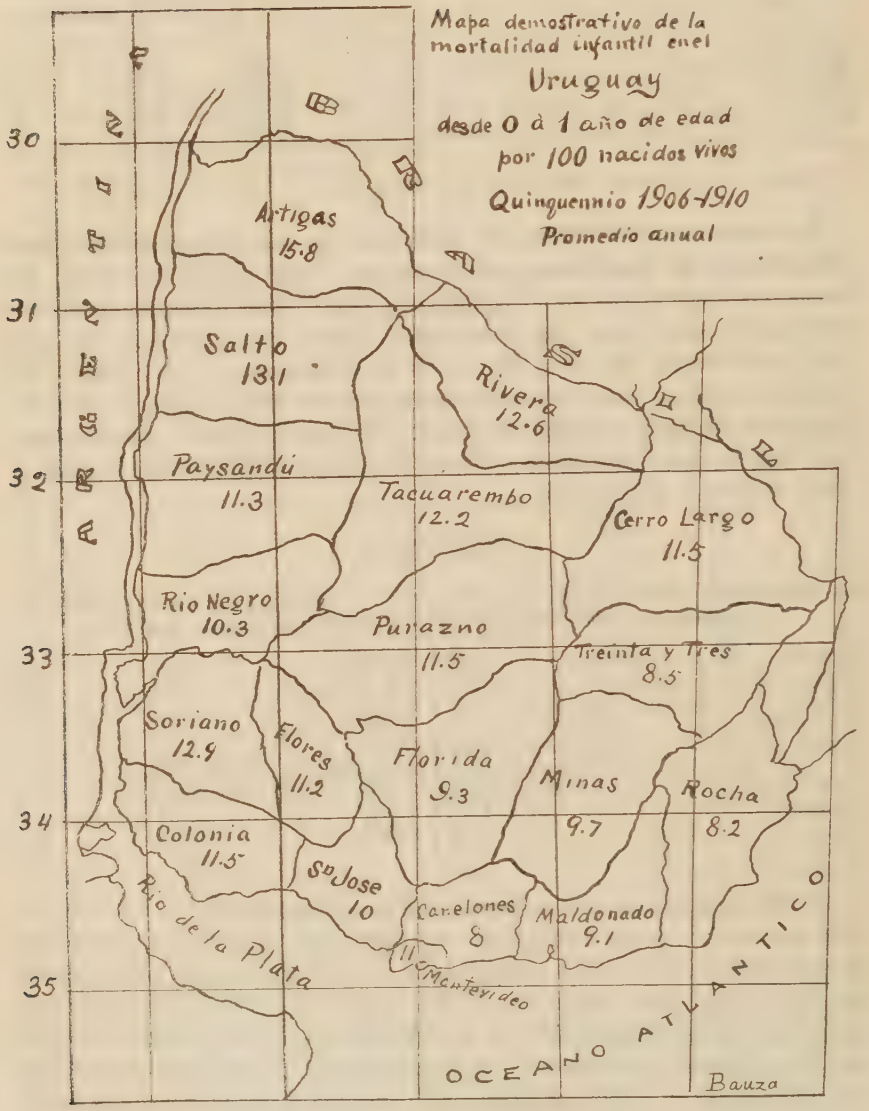
CUADRO No. 4.

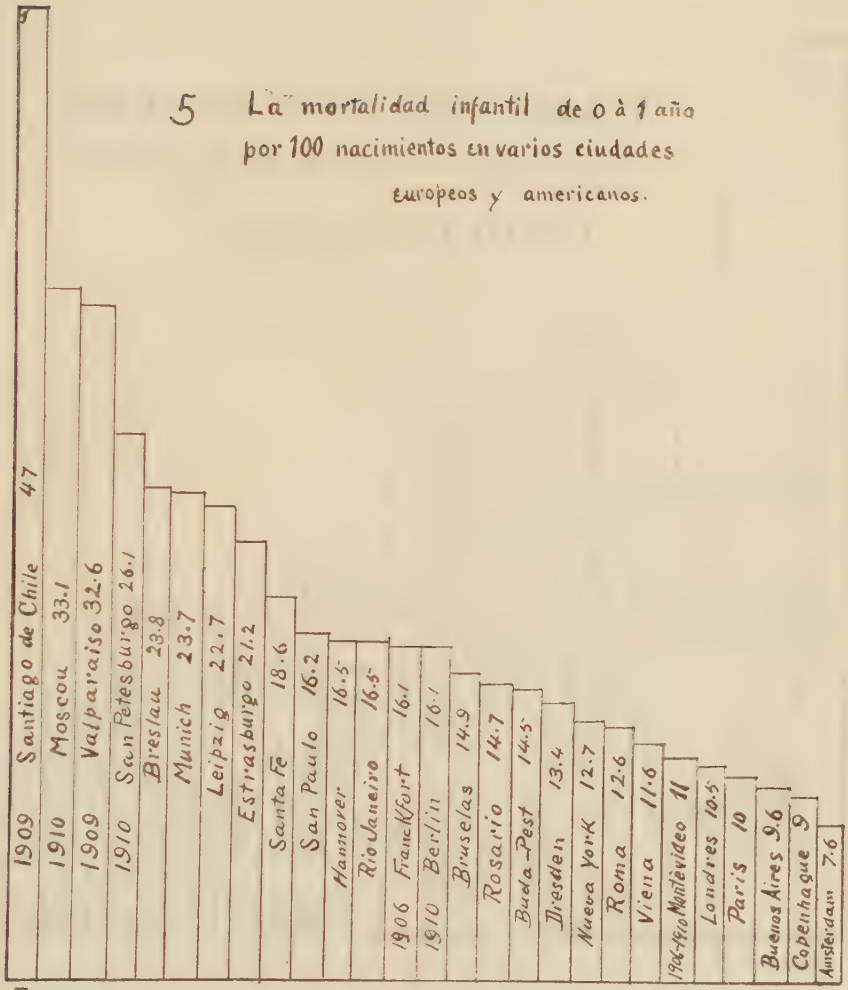
La mortalidad infantil desde 0 à 1 año en el Uruguay an les departamentos en el quinquenio 1906–1910, por 100 nacidos vivos (*Véase, p. 436*).

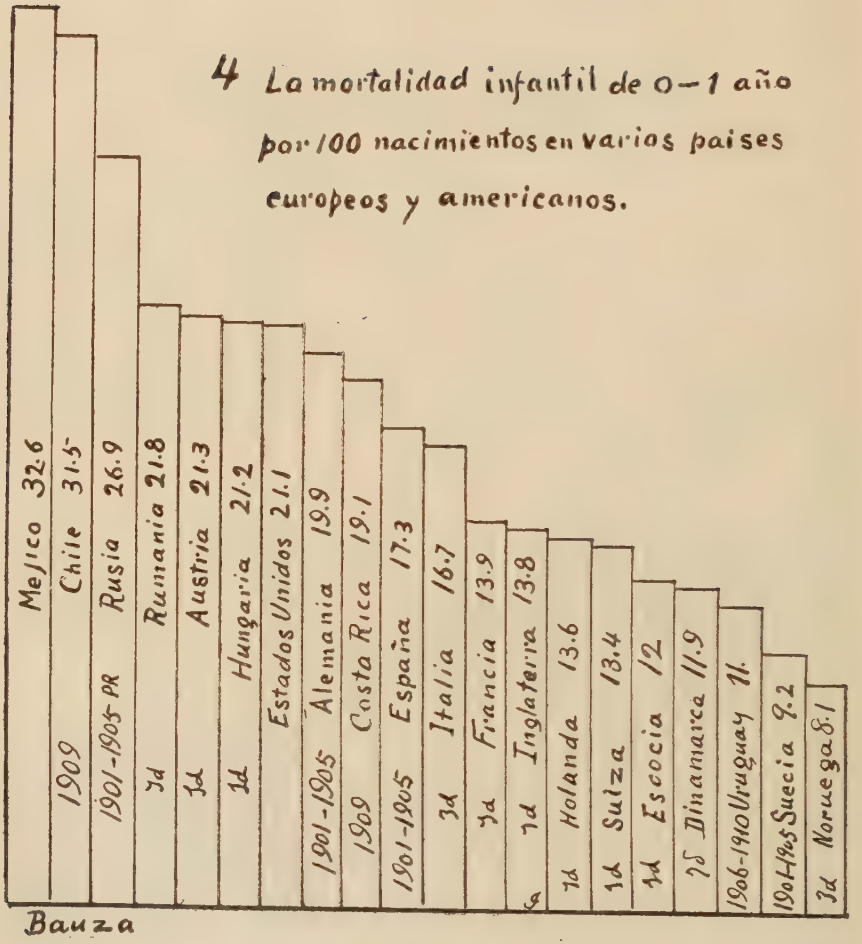
Artigas	15. 8	Rio Negro	10. 3
Salto	13. 1	San Jose	10. 0
Rivera	12. 6	Minas	9. 7
Tacuarembo	12. 2	Florida	9. 3
Soriano	12. 9	Colonia	9. 2
Durazno	11. 5	Maldonado	9. 1
Cerro Largo	11. 5	Treinte y Tres	8. 5
Paysandu	11. 3	Rocha	8. 2
Flores	11. 2	Canelones	8. 0
Montevideo	11. 0		

Es casi general en esta nómina, que los Departamentos del Norte y que por tanto poseen un clima un poco más riguroso, tengan una mortalidad infantil más elevada que los del Sur; Río Negro entre los del Norte, hace excepción á esta regla. Si observamos ahora la situación de la República y la de Montevideo, comparándola con la de otros países y ciudades, observaremos que realmente ocupamos un puesto que es aún envidiable para infiinidad de países europeos y americanos.

Los cuadros adjuntos expresan más fielmente nuestra condición de país de mortalidad infantil poco elevada.


Mapa demostrativo de la mortalidad infantil en el
Uruguay
desde 0 á 1 año de edad
por 100 nacidos vivos
Quinquennio 1906-1910
Promedio anual
30
31
32
33
34
35
Artigas 15.8
Salto 13.1
Rivera 12.6
Paysandú 11.3
Tacuarembo 12.2
Cerro Largo 11.5
Rio Negro 10.3
Durazno 11.5
Treinta y Tres 8.5
Soriano 12.9
Flores 11.2
Florida 9.3
Minas 9.7
Rocha 8.2
Colonia 11.5
Sn Jose 10
Canelones 8
Maldonado 9.1
Montevideo
Rio de la Plata
OCEANO ATLANTICO
Bauza


5 La mortalidad infantil de 0 à 1 año
por 100 nacimientos en varios ciudades
europeos y americanos.
1909 Santiago de Chile 47
1910 Moscou 33.1
1909 Valparaiso 32.6
1910 San Petesburgo 26.1
Breslau 23.8
Munich 23.7
Leipzig 22.7
Estrasburgo 21.2
Santa Fé 18.6
San Paulo 16.2
Hannover 16.5
Rio Janeiro 16.5
1906 Frankfort 16.1
1910 Berlin 16.1
Bruselas 14.9
Rosario 14.7
Buda-Pest 14.5
Dresden 13.4
Nueva York 12.7
Roma 12.6
Viena 11.6
1904-1910 Montevideo 11
Londres 10.5
Paris 10
Buenos Aires 9.6
Copenhague 9
Amsterdam 7.6
Bauza


4 La mortalidad infantil de 0–1 año por 100 nacimientos en varios paises europeos y americanos.
Mejico 32.6
1909 Chile 31.5
1901-1905 PR Rusia 26.9
Id Rumania 21.8
Id Austria 21.3
Id Hungaria 21.2
Estados Unidos 21.1
1901-1905 Alemania 19.9
1909 Costa Rica 19.1
1901-1905 España 17.3
Id Italia 16.7
Id Francia 13.9
Id Inglaterra 13.8
Id Holanda 13.6
Id Suiza 13.4
Id Escocia 12
Id Dinamarca 11.9
1906-1910 Uruguay 11.
1904-1908 Suecia 9.2
Id Noruega 8.1
Bauza

CUADRO No. 5.

La mortalidad infantil de 0 a 1 año relacionada con la natalidad en 28 ciudades (*Véase, p. 437*).

Santiago de Chile (1909)	47.0	Bruselas (1910)	14.9
Moscau (1910)	33.1	Rosario (1910)	14.7
Valparaiso (1909)	32.6	Buda Pest (1910)	14.5
S. Peterburgo (1910)	26.1	Dresde (1910)	13.4
Breslau (1910)	23.8	Cassel (1910)	13.4
Munich (1910)	23.7	Nueva York (1910)	12.7
Leipsig (1910)	22.7	Roma (1910)	12.6
Estrasburgo (1910)	21.2	Montevideo (1910)	12.6
Santa Fe (1910)	18.6	Viena (1910)	11.6
S. Paulo (1910)	16.7	Londres (1910)	10.5
Hannover (1910)	16.5	Paris (1910)	10.0
Rio Janeiro (1910)	16.5	Buenos Aires (1910)	9.6
Frankfort (1910)	16.1	Copenhagen (1910)	9.0
Berlin (1910)	16.1	Amsterdam (1910)	7.6

CUADRO No. 6.

La mortalidad infantil de 0 à 1 año per 100 nacimentos en los principales paises europeos y americanos (*Véase, p. 438*).

Mejico	32.6	Italia (1901–1905)	16.7
Chile (1909)	31.5	Francia (1901–1905)	13.9
Rusia (1901–1905)	26.9	Inglaterra (1901–1905)	13.8
Rumania (1901–1905)	21.8	Holanda (1901–1905)	13.6
Austria (1901–1905)	21.3	Suiza (1901–1905)	13.7
Hungary (1901–1905)	21.2	Escocia (1901–1905)	12.0
Estados Unidos	21.1	Dinamarca (1901–1905)	11.9
Alemania (1901–1905)	19.9	Uruguay (1906–1910)	11.0
Costa Rica (1909)	19.1	Suecia (1901–1905)	9.2
Espana (1901–1905)	17.3	Norvega	8.7

La mortalidad infantil tiende á elevarse en el Uruguay, al revés de lo que pasa en los países de Europa, en los que se nota un decrecimiento importante. Este aumento es mayor en la campaña, lo cual debe explicarse por la mayor ignorancia de las mujeres del campo, y por la alimentación artificial prematura y defectuosa.

En Montevideo observamos en el decenio 1901–1910, que el año 1907, año de larga guerra civil y de miseria, es el que ofrece el coeficiente menor de mortalidad infantil 9.5 por 100. Se reproduce el caso del sitio de París en 1871, durante el cual el número de fallecidos de menos de 1 año fué muy inferior al de los años precedentes. La explicación que se ha dado de este fenómeno curioso y que creemos también aplicable á Montevideo, es que cuando reina la escasez en la clase pobre, la alimentación natural á pecho se prolonga y la artificial se retarda, de lo cual fluye naturalmente que el niño está menos amenazado en su salud, se enferma más difícilmente y por tanto el número de defunciones debe disminuir.

El examen del cuadro 6 revela con toda nitidez la situación favorable del Uruguay en lo concerniente á la mortalidad de los menores de 1 año. De los 20 Estados mencionados, sólo 2 poseen un coeficiente de mortalidad infantil inferior á nuestro país; son Suecia y Noruega. Sin embargo tratándose de un país pequeño y totalmente civilizado,

se comprende que todavía sería factible no sólo evitar el crecimiento de su mortalidad infantil, sino también disminuirla en 2 ó 3 unidades. Constituye un hecho digno de llamar la atención, que los países que poseen una natalidad mayor son en general los que presentan mortalidad infantil más crecida. La razón reside en las estrechas relaciones psicológicas existentes entre la mortalidad infantil y la natalidad. Donde nacen pocos niños, está en el interés de los padres extremar los cuidados para mantener la descendencia; y por el contrario, donde se produce una laguna, la descendencia está comprometida y por tanto existe el interés de llenar esa laguna. Natalidad grande produce mortalidad infantil elevada y mortalidad infantil exagerada, provoca como reacción, natalidad también elevada.

LA MORTALIDAD INFANTIL DE 0 Á 5 AÑOS.

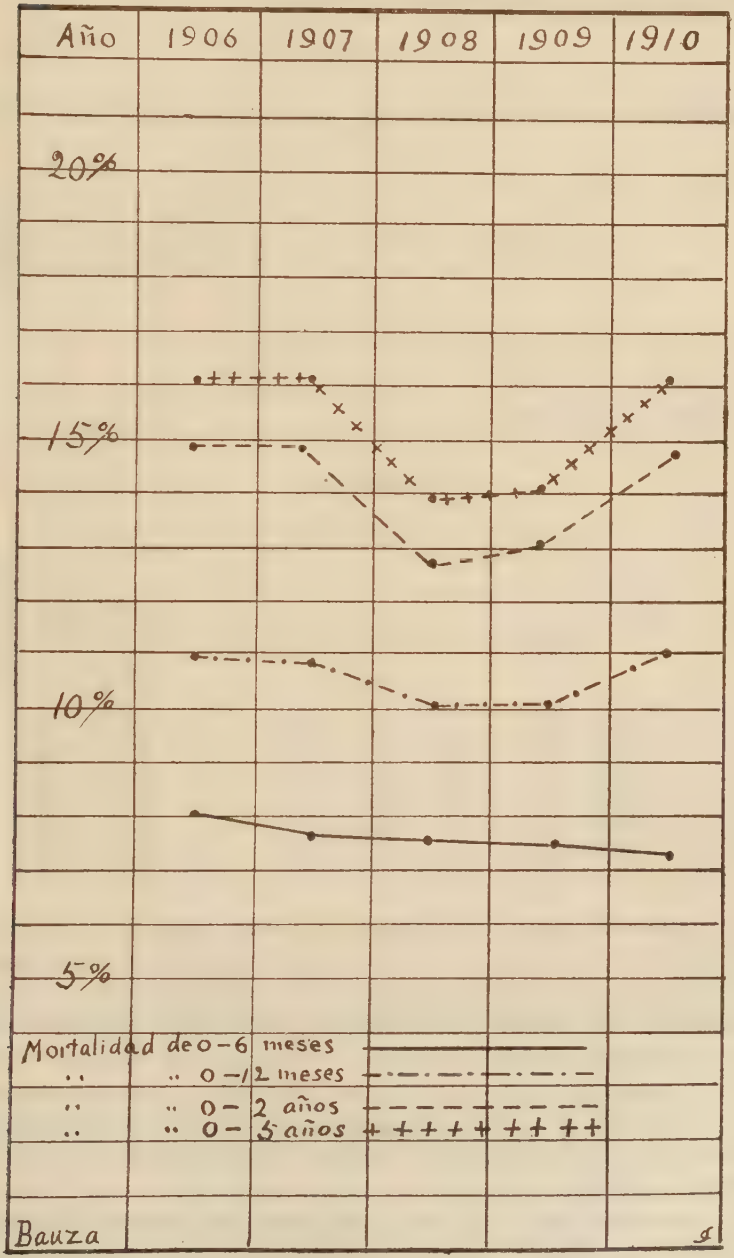
El paralelismo de las líneas que representan la mortalidad infantil se rompe en el año 1910 en la línea correspondiente á las defunciones de 0 á 1 año; mientras la mortalidad de 0 á 6 meses disminuye lentamente, desde 1906 á 1910, la línea que indica la mortalidad de 0 á 1 año, después de haber descendido ligeramente hasta 1909, se eleva en 1910, poniendo bien en evidencia que el aumento debe en este año referirse á niños de 6 meses á 1 año de edad. Esta elevación de la mortalidad existe también aunque en grado menor en los niños de 1 á 2 años y de 2 á 5 años, en el año indicado (Véase, p. 441).

No hay más que echar un golpe de vista sobre el cuadro No. 7, para apreciar que la mortalidad de 6 meses á 1 año en 1910 es de 3.9, la más alta del quinquenio. No cabe por tanto duda alguna que ese año fué funesto para los niños de esa edad, y ellos han sido los que han contribuído á aumentar la mortalidad infantil de ese año.

Comparando la mortalidad infantil antes del mes, relacionada con la natalidad en toda la República, con la que presentan otros países europeos, observaremos que le corresponde al Uruguay uno de los mejores puestos en la lista siguiente:

Baviera	8.38
Austria	8.26
Wurtemberg	7.43
Sajonia	6.39
Bulgaria (1902–1903)	5.83
Prusia	5.68
Francia	4.89
Finlandia	4.01
Dinamarca	3.92
Uruguay (1906–1910)	3.60
Holanda	3.15
Suecia	3.12
Noruega	2.86

6. Grafica demostrativa de la mortalidad infantil de 0 á 5 años en el Uruguay (1906-1910), por 100 nacimientos.



Treintiseis defunciones de 0 á 1 mes por 1,000 nacimientos en el Uruguay, dicen bien elocuentemente que los peligros que amenazan al niño en el primer mes de la vida, no son tan pocos en nuestro país como en la mayor parte de los países europeos, siendo sólo aventajado por Holanda, Suecia y Noruega.

CUADRO No. 7.

Mortalidad infantil según la edad, en los menores de 1 año, relacionada con la natalidad.

Años.	Fallecen por 100 nacimientos, de 0 á 1 mes.	Fallecen por 100 nacimientos, desde 1 á 6 meses.	Fallecen por 100 nacimientos, desde 7 á 12 meses.
1906	3.6	4.3	3
1907	3.8	3.9	3.1
1908	3.6	4	2.4
1909	3.5	3.9	2.6
1910	3.5	3.6	3.9
Promedio del quinquenio 1906–1910	3.6	3.9	3

CUADRO No. 8.

Años.	Nacidos en toda la República.	Fallecidos menores de 2 años.			Fallecidos por 100 nacimientos.			Fallecidos de 2 á 5 años.	Promedio de fallecidos menores de 5 años, por 100 nacimientos.
		De 0 á 1 año.	De 1 á 2 años.	Total.	Menos de 1 año.	De 1 á 2 años.	Promedio de 0 á 2 años.		
1901	31,703	3,235			10.2				
1902	31,526	3,358	746	4,104	10.6	2.3	12.9	367	14.1
1903	32,600	3,557	1,091	4,648	10.9	3.3	14.2	440	15.5
1904	26,984	2,398	870	3,268	8.9	3.2	12.1	432	13.7
1905	33,709	2,775	881	3,656	8.2	2.6	10.8	337	11.8
1906	32,578	3,558	1,270	4,828	10.9	3.9	14.8	445	16.1
1907	33,657	3,662	1,285	4,947	10.8	3.8	14.6	439	16
1908	35,520	3,574	971	4,545	10	2.7	12.7	336	13.7
1909	35,663	3,583	1,032	4,615	10	2.9	12.9	394	14
1910	35,927	3,978	1,299	5,277	11	3.6	14.6	454	15.9

Un punto de gran importancia á tratar cuando se estudie la natalidad de un país, es el referente á la ilegitimidad de los nacidos. Keller afirma que todo niño ilegítimo está constantemente en peligro; de modo que los países que tienen más nacimientos ilegítimos serán los de mortalidad infantil más alta. Esto, que tal vez sea verdadero para los países europeos; no es exacto para los países americanos y sobre todo para el nuestro en que generalmente los nacimientos ilegítimos son numerosos, y sin embargo la mortalidad infantil es bastante reducida.

De cualquier modo, es un punto negro en nuestra civilización, tener 26.6 por 100 de nacimientos ilegítimos, cifra sólo sobrepasada por Chile que tiene 35.

He aquí las cifras de algunos países europeos y americanos:

España	5.5
Inglaterra	5.2
Francia	7.2
Italia	7.7
Alemania	8.7
Bélgica	7.6
Austria	13.1
Brasil	24.3
Argentina	25.2
Uruguay	26.6
Chile	35

Si estudiamos ahora los nacimientos ilegítimos por ciudades, encontramos también para Montevideo una cifra bastante elevada.

CUADRO No. 9.

Nacimientos ilegítimos por 100 nacimientos.

Praga	43.8
Estokolmo	31.4
Viena	30
Budapest	27
Nancy	24
Moscou	21.8
Coruña	21.6
Breslau	21.1
Río Janeiro	20.6
Leipzig	20.5
Montevideo	18.8
Bukarest	18.1
S. Petersburgo	17.9
Santa Fé	16.3
Bruselas	15.8
Hamburgo	14.6
Berlín	14.7
Madrid	13.5
Buenos Aires	12.6
Rosario	10.7
Milán	7.1
Amsterdam	4.3

LA MORTALIDAD INFANTIL, RELACIONADA CON LAS CAUSAS QUE LA PRODUCEN.

La República del Uruguay no posee, según hemos visto, comparando su mortalidad infantil con la de otros países Europeos y Sud-Americanos, un coeficiente elevado. Sin embargo, si se entra á estudiar las causas que producen la mortalidad de los menores de un año, se encuentra que podría reducirse esa mortalidad á cifras muy inferiores de las que presenta la actualidad. Tomemos, por ejemplo, la debilidad congénita.

Por debilidad congénita debe entenderse un estado de desarrollo insuficiente, que hace que las funciones vitales del recien nacido se cumplan con dificultad en condiciones normales, y no puedan continuar, y determinen la muerte, cuando sufren alteración sin que exista enfermedad. Por consiguiente, entran en este grupo los prematuros cuyo desarrollo es incompleto, y los niños que aunque nacidos de término poseen un peso muy inferior al normal, descendientes de padres enfermos ó con alguna tara que produzca la degeneración de los descendientes. El concepto debilidad congénita tiene pues importancia desde el punto de vista del estado de una raza, y puede decirse que es indicio de la vitalidad del país. De aquí que su estudio sea importante desde el punto de vista estadístico, como causa de muerte. Desgraciadamente, la estadística de la debilidad congénita ofrece numerosas lagunas. Es indudable que un cierto número de los inscriptos como nacidos muertos, han nacido con vida, para morir horas mas tarde, sin que sea así declarado al médico. Muchos confunden la debilidad congénita con la inaptitud para la vida, por un vicio de conformación; como, por ejemplo, labio-leporino completo, espina bífida, etc.; un niño así está ciertamente en inferioridad de condiciones y fácilmente adquirirá una enfermedad intestinal ó broncopulmonar aun cuando pueda no ser un débil congénito. Y en estos casos depende del médico si en la causa de la mortalidad la debilidad congénita se señalará como causa primitiva ó secundaria. Muchos niños débiles congénitos son, sifilíticos hereditarios y muchas veces por causa del origen de esta enfermedad, no se la daclara en la defunción y va con la etiqueta de debilidad congénita, aumentándose así la cifra verdadera.

En el estudio de las consideraciones precedentes, debe buscarse la explicación de las diferencias extraordinarias que se encuentran en diferentes ciudades. Del estudio practicado por Erös en 17 ciudades, se encuentra para Nápoles la cifra más baja, 0.95 por ciento nacimientos y Praga la más alta 10.7 por ciento. En Montevideo, de 1,000 nacidos con vida mueren en 1908, 12.3; en 1909, 12.8, y en 1910, 12.1, por debilidad congénita. En el resto de la República los datos son incompletos y es tan grande el número de las defunciones sin causa especificada, 30 por ciento ó más, que es imposible hacer estadística de valor.

Sería de desear que las autoridades á las cuales corresponda, tomen nota de este defecto y traten de subsanarlo en lo posible.

Si consideramos la debilidad congénita en relación á la mortalidad infantil total, tenemos que ella constituye aproximadamente el décimo; la cifra más alta del decenio corresponde al año 1903 con 16.9 por 100 fallecidos menores de 1 año, y la más baja 6 por ciento en el año 1906. Estos datos se refieren á Montevideo. El 25 por ciento aproximadamente de los fallecidos en el primer mes, es debido á la

debilidad congénita. Estas cifras son bastante bajas si se relaciona con otras ciudades europeas, como Hamburgo, Frankfort, etc., que dan un coeficiente de 50 á 60 por ciento. Las causas que la producen son: La debilidad, el alcoholismo, la tuberculosis, la sífilis, el trabajo exagerado de la madre y la miseria á la mala alimentación. Es por tanto en este sentido que hay que orientar la profilaxia, estableciendo el seguro de las madres obreras y la protección de las embarazadas en el mes que precede al parto. En este sentido, Montevideo cuenta con un refugio de embarazadas, en el cual son admitidas las madres pobres en la época que precede al parto. Durante un tiempo, de 1 á 2 meses, son alimentadas y cuidadas y al mismo tiempo se les enseña á preparar las ropas que ha de usar el futuro bebé. Esta protección se extiende hasta después del parto, para las madres solteras á las cuales se les busca una colocación donde sean admitidas con el hijo.

ENFERMEDADES CONTAGIOSAS.

Las enfermedades contagiosas, tanto en nuestro país como en otros, no producen casi defunciones en los menores de 1 año. La diftería, la escarlatina, el sarampión, apenas se señalan. La tos convulsa, la tuberculosis y la sífilis, y especialmente estas dos últimas, ya comienzan á hacer más estragos. La tuberculosis en sus diferentes formas da un promedio que oscila entre 0.7 en 1902 y 2.6 en 1903 por 100 fallecidos menores de 1 año. Esta cifra es seguramente inferior á la normal, pues bien sabemos que pocas veces se hace el diagnóstico de tuberculosis en el niño chico. En cuanto á la sífilis, el coeficiente oscila entre 0.9 en 1909 y 3.8 por ciento en 1908.

Otras enfermedades contagiosas, como la viruela, pasan años sin que se registre una defunción. Sin embargo no debe dejar de señalarse que en la epidemia que se declaró en 1910, fallecieron en Montevideo 32 niños menores de 1 año en un total de 1,199 defunciones, esto es 2.7 por ciento. La institución de la vacunación obligatoria ya decretada por el Gobierno, evitará que se produzca entre nosotros la terrible mortalidad infantil por viruela que azotó á Santiago de Chile en 1909 y 1910.

El tétano constituye también una enfermedad á la cual le dedicamos en la necrología un cuadro aparte. Si bien la mortalidad que ofrece la estadística no es muy grande, creemos firmemente que debe ser mucho mayor y que debe entrar en buen número en el grupo de las enfermedades no especificadas ó mal definidas de la campaña. En Rumania mueren de tétano infantil más de 2,000 niños por año.

En Montevideo, el coeficiente oscila entre 5 en 1904 y 0.6 por ciento en 1910; como puede verse en el cuadro respectivo esta enfermedad disminuye y tiende á desaparecer como sucederá cuando toda parturienta esté bien asistida. En el año 1910 se produjeron en Montevideo 7 defunciones por tétano infantil. En campaña, donde la asistencia

deja aún bastante que desear, pasa otra cosa. En el Departamento de Tacuarembó, cuya población es un décimo de la de Montevideo, se producen sin embargo 9 defunciones por esta causa.

Convulsiones.—Otro importante grupo en la necrología infantil lo constituyen las convulsiones ó eclampsía infantil. Por cada 100 defunciones de menos de 1 año se producen de 5 á 6 por esta causa ó 0.5 por 1,000 nacimientos. Esta cifra no puede corresponder á todos los casos, pues muchas convulsiones son sólo un síntoma, sea de una afección meningea ó de una gastroenteritis. Por este motivo, una comparación es en este sentido de un valor muy problemático. De cualquier modo, comparando las estadísticas, puede afirmarse que la mortalidad por convulsiones es en Montevideo 20 ó 30 veces más baja que en gran número de ciudades europeas.

Meningitis.—La meningitis es en su inmensa mayoría de los casos, una enfermedad secundaria, vale decir una complicación, y la terminación bastante habitual de las broncopneumonia y de las gastroenteritis. Otras veces es un niño que muere por convulsiones de causa desconocida y que se clasifica de meningitis. Sería de desear que en todos los casos en los que la meningitis es la causa de la muerte, no se olvidase de colocar la afección primitiva, que es la que realmente debe figurar en la estadística. Es para mí indiscutible que un buen número de casos de meningitis son gastroenteritis ó broncopneumonia disimulados.

Si tomamos la cifra que la estadística ofrece, encontramos que por 100 niños fallecidos menores de 1 año, 10 son por meningitis aguda.

Enfermedades del aparato respiratorio.—Las enfermedades del aparato respiratorio, bronquitis, neumonía, y bronconeumonía forman entre nosotros un cociente elevado en la mortalidad infantil. En efecto, del examen del cuadro No. 10, se deduce que el 25 por ciento de las defunciones en niños menores de 1 año se producen debido á afecciones bronco-pulmonares, oscilando esta cifra entre 20 en 1905 y 26.5 en 1901 y 26 en 1910. Por 1,000 niños nacidos vivos mueren 26 por afecciones bronco-pulmonares antes del año en Montevideo.

La explicación de esta cifra tan elevada, casi igual á la que ofrecen ciudades cuyo clima es mucho más frío que el nuestro, como Berlín con 27 por 1,000 en 1901 y Hamburgo 29.39 en 1896, no debe buscarse sino en las condiciones climatológicas y sociales de cada ciudad. El clima de Montevideo es poco frío, y húmedo en invierno y ofrece grandes oscilaciones de temperatura en un mismo día, de manera que se facilita la producción de las enfermendades de las vías aéreas. Pero es indudable que no es este el principal factor, sino que creo más importante las deplorables condiciones en que vive el proletariado, en su mayor parte en viviendas frías, obscuras y húmedas. No de otra manera puede explicarse como Santiago de Chile, con un clima muy semejante al de Montevideo, ofrece cifras aterradoras, 37

por ciento de defunciones de menores de 1 año y 155 por 1,000 nacidos vivos en 1909.

No creemos que pueda darse otra explicación de esta catástrofe, que la miseria reinante entre la clase pobre. La profilaxia de este mal, estaría en la construcción de casas higiénicas para obreros y en la supresión de las miserables covachas que aun sirven de habitación á muchas familias obreras.

No debemos dejar de señalar que en el número de niños fallecidos por afecciones bronco-pulmonares, deben existir en cifra no pequeña, aquellos en los cuales la broncopneumonía aparece como complicación generalmente de una gastroenteritis aguda. Si se observa la gráfica de la mortalidad, puede verse que al descenso máximo que se produce en el mes de junio, sigue un ascenso en julio y agosto, que se debe especialmente á las enfermedades del aparato respiratorio, siguiendo en setiembre un nuevo descenso, seguido de ascenso continuado en octubre, noviembre y diciembre, que so debe á las enfermedades gastro-intestinales.

ENFERMEDADES GASTRO-INTESTINALES.

Montevideo es una ciudad en la que la patología infantil domina la gastro-enteritis, como en la mayor parte de las ciudades. El verano dura, puede decirse que desde noviembre hasta marzo, es decir más ó menos cinco meses. La temperatura llega á límites bastante extremos, pasando muchas veces de 30° C. y llegando algunas veces aunque no persista hasta 38° C. á la sombra. Se comprende por tanto que la gastro-enteritis se observe en todas sus formas desde las atenuadas hasta las fulminantes, verdaderos coup de chaleur, caracterizados por diarrea, vómitos, fiebre, convulsiones y muerte rápida. En la etiología de la gastro-enteritis del verano, además de la acción directa de la temperatura sobre el niño, sobre todo si no es alimentado á pecho, disminuyendo su resistencia y su tolerancia por la leche y exaltando la virulencia de las bacterias del tubo intestinal, no debe olvidarse la acción de la sequedad del aire, que aumenta la evaporación y por tanto hace que el niño se defienda de la temperatura elevada por una exageración en la sed, que se traduce casi siempre en una sobre alimentación perjudicial.

También debe señalarse la acción altamente nociva de la temperatura sobre la leche que se emplea en la alimentación mixta ó artificial de los pequeños, leche que viene por ferrocarril y que se expende al consumidor 6, 8 ó 10 horas después de ordeñada, cuando los gérmenes se han multiplicado por millones. Es indudable que una leche que está trasformada en caldo de cultura, aun cuando sea servida no debe considerarse como inofensiva. Todas estas consideraciones tienden á explicar el coeficiente elevado que ofrece la estadística de la mortalidad por diarrea y enteritis.

El 28 por ciento de las defunciones antes del año, son debidos á la gastro-enteritis. Las cifras oscilan entre 22 en 1902 y 30 en 1910 por ciento. Por 1,000 nacidos vivos mueren 29 antes del año por gastro-enteritis. En Berlín mueren 79 por 1,000, como promedio anual desde 1901 á 1905. En Estados Unidos fallecen 40.3 por ciento de menos de 1 año por afecciones gastro-intestinales.

Enfermedades varias.—Con esta denominación van comprendidas otras enfermedades no mencionadas por separado, entre las cuales debe citarse el sarampión, la difteria, la escarlatina, la viruela, la erisípela, que forman aisladamente un cociente insignificante y por lo cual no figuran en las gráficas adjuntas. Los vicios de conformación congénita van incluídos en este grupo, formando más de la mitad del coeficiente indicado en las gráficas que es como término medio de 17 por ciento de defunciones de menores de 1 año.

CUADRO No. 10.

Mortalidad infantil en Montevideo desde 1901 á 1910.

Año.	Debilidad congénita.	Sífilis.	Tuberculosis.	Convulsiones.	Meningitis.	Tétano.	Enfermedades broncho-pulmonares.	Enfermedades gastro-intestinales.	Otras enfermedades.	Total.
1901	150	30	14	32	87	25	253	275	97	963
1902	157	33	7	40	81	34	241	205	133	931
1903	163	34	25	50	94	33	196	260	120	965
1904	69	21	10	29	97	37	162	178	134	737
1905	69	31	12	47	78	26	155	173	175	776
Total en el quinquenio	608	149	68	198	437	155	1,007	1,091	659	4,372
1906	55	26	17	44	106	40	235	222	154	899
1907	74	29	17	60	90	33	184	255	145	887
1908	109	33	13	51	71	17	191	233	145	863
1909	120	9	8	56	110	26	226	265	189	1,009
1910	113	15	9	65	127	7	312	352	199	1,199
Total en el quinquenio	471	112	64	276	504	123	1,148	1,327	832	4,857

CUADRO No. 11.

Causas de las defunciones en Montevideo.

QUINQUENIO 1901-1905.

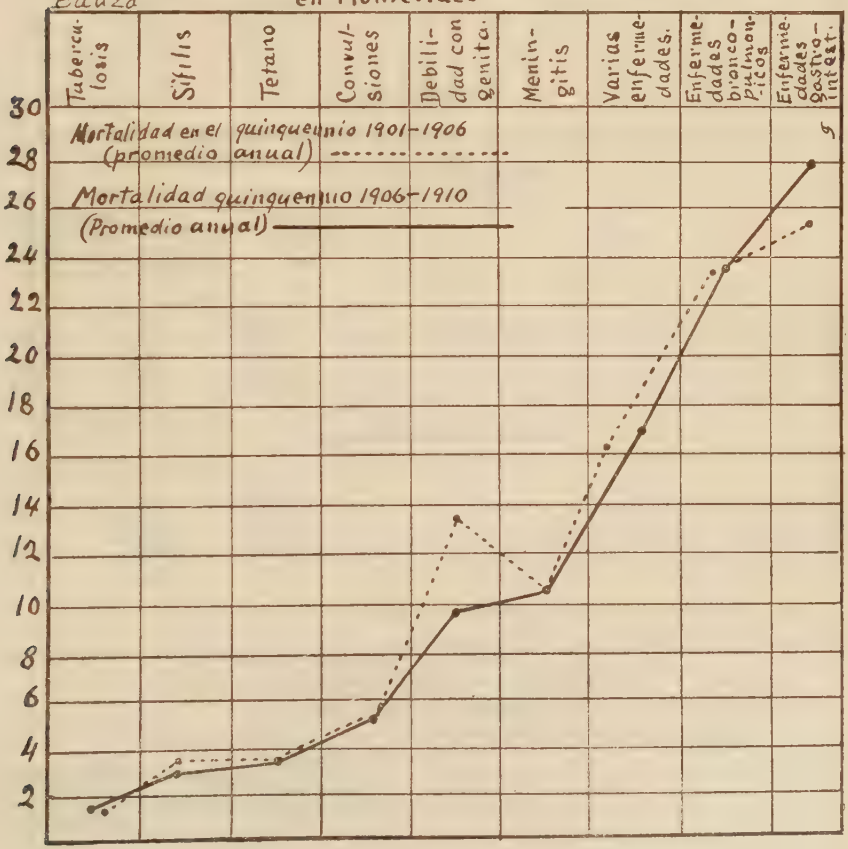
Año.	De 100 defunciones se producen por—								
	Tuberculosis.	Sífilis.	Meningitis.	Convulsiones.	Tétano.	Afecciones broncho-pulmonares.	Afecciones gastro-intestinales.	Debilidad congénita.	Otras enfermedades.
1901	1.4	3.1	9.1	3.3	2.5	26.5	28.5	15.5	10
1902	.7	3.5	8.7	4.3	3.6	25.8	22	16.8	14.6
1903	2.6	3.5	9.7	5.2	3.4	20.3	27	16.9	11.4
1904	1.3	2.8	13.1	3.9	5	22	24.1	8.7	19.1
1905	1.5	4	10	6	3.3	20	22.3	8.3	24.6

Causas de las defunciones en Montevideo—Continúa.

QUINQUENIO 1906-1910.

Año.	De 100 defunciones se producen por—								
	Tuberculosis.	Sífilis.	Meningitis.	Convulsiones.	Tétano.	Afecciones broncho-pulmonares.	Afecciones gastro-intestinales.	Debilidad congénita.	Otras enfermedades.
1906	1.9	2.9	11.9	4.9	4.4	26.22	24.6	6	17.20
1907	1.9	3.2	10.1	6.7	3.6	20.7	28.7	8.3	16.8
1908	1.5	3.8	8.2	5.9	2	22.1	28.2	12.6	15.7
1909	.8	.9	11	5.5	2.6	22.24	26.2	11.8	19
1910	.7	1.1	10.5	5.4	.6	26	30	9.4	16.30

12. Diagrama demostrativo de la mortalidad infantil en Montevideo.
Bauza



CUADRO No. 13.

La mortalidad infantil relacionada con la mortalidad general en toda la República.

QUINQUENIO 1901–1905.

Año.	Mortalidad en toda la República.	Mortalidad menores de 1 año.	Defunciones menores de 1 año, por 100 defunciones.
1901	12,504	3,235	25.8
1902	13,439	3,358	24.9
1903	13,673	3,557	26
1904	11,515	2,398	20.8
1905	13,612	2,775	20.4
QUINQUENIO 1906–1910.			
1906	15,083	3,558	23.5
1907	15,561	3,662	23.5
1908	14,421	3,574	24.7
1909	15,249	3,583	23.5
1910	16,515	3,978	24

CUADRO No. 14.

La mortalidad infantil relacionada con la mortalidad general en Montevideo.

QUINQUENIO 1901–1905.

Año.	Mortalidad en Montevideo.	Mortalidad de menores de 1 año.	Defunciones menores de 1 año, por 100 defunciones.
1901	4,374	963	22
1902	4,466	931	20.8
1903	4,532	965	21.3
1904	4,639	737	15.9
1905	4,402	776	17.6
QUINQUENIO 1906–1910.			
1906	5,042	899	17.8
1907	4,980	887	17.8
1908	4,822	863	17.7
1909	5,466	1,009	18.4
1910	6,162	1,199	19.4

CUADRO No. 15.

La mortalidad infantil relacionada con la mortalidad general en toda la República, excluído Montevideo.

QUINQUENIO 1901–1905.

Año.	Mortalidad en la República, excluído Montevideo.	Mortalidad de menores de 1 año.	Defunciones menores de 1 año, por 100 defunciones.
1901	8,130	2,272	27.9
1902	8,973	2,427	27
1903	9,141	2,592	28.3
1904	6,876	1,661	24.1
1905	9,210	2,000	21.7

La mortalidad infantil relacionada con la mortalidad general en toda la República, excluído Montevideo—Continúa.

QUINQUENIO 1906–1910.

Año.	Mortalidad en la República, excluído Montevideo.	Mortalidad de menores de 1 año.	Defunciones menores de 1 año, por 100 defunciones.
1906	10,041	2,660	26.4
1907	10,581	2,775	26.2
1908	9,599	2,691	28
1909	9,783	2,574	26.1
1910	10,453	2,779	26.6

La mortalidad infantil en los menores de 5 años, relacionada con la mortalidad general en varias ciudades. Por cada 1,000 defunciones se producen en:

Ciudades.	0 á 1 años.	0 á 2 años.	0 á 5 años.
Montevideo (1910)	194	272	295
Buenos Aires	206	281	340
Río Janeiro	223	304	372
Nueva York (1909)	228	.....	.....
Berlín	231	268	305
Breslau	270	304	335
Santa Fe	278	386	436
Rosario (República Argentina)	281	383	444
Sao Paulo	316	396	438
Santiago de Chile (1909)	380	442	481
Valparaíso (1909)	389	481	497
Méjico (1905)	278	.....	.....
Cairo	.....	540	.....

Como se ve, Montevideo es la ciudad más favorecida de todas las enunciadas, siguiéndole de cerca Buenos Aires, Valparaíso y Santiago de Chile, ciudades que poseen casi el mismo clima que Montevideo, presentan cifras dos veces más elevadas. El Cairo es la ciudad que da la cifra más alta. Por cada 1,000 defunciones, 540 se producen en niños menores de 2 años.

LA MORTALIDAD INFANTIL RELACIONADA CON LA MORTALIDAD GENERAL EN EL URUGUAY—ESTUDIO COMPARATIVO CON OTROS PAÍSES EUROPEOS Y AMERICANOS.

LA MORTALIDAD INFANTIL DE MONTEVIDEO RELACIONADA CON LA MORTALIDAD GENERAL.

Por cada 1,000 defunciones que se producen en el territorio de la República 240 corresponden á niños menores de 1 año, es decir, el cuarto de la general. Y si extendemos el plazo á los menores de 5 años, encontramos que por 1,000 defunciones 347, cifra del año 1910 y casi la más alta del quinquenio 1906–1910, corresponde á los menores de esta edad.

Chile que se caracteriza por su elevada mortalidad infantil, da un coeficiente de 50 por ciento de defunciones antes de los 5 años y de 38 por ciento antes de 1 año. Venezuela da un coeficiente de 37.3 por ciento antes de los cuatro años.

Si consideramos la mortalidad infantil en Montevideo relacionándola con la general, tenemos que oscila en el quinquenio 1905–1910 desde 17.7 en 1908 hasta 19.4 por ciento en 1910; mientras que si consideramos toda la República, descartada la Capital, la cifra se eleva á 26 y hasta 28 por ciento en 1910. La causa de esta diferencia no debe buscarse en la menor mortalidad infantil de la campaña con respecto á la Capital puesto que los cuadros y mapas publicados en otro lugar demuestran lo contrario, sino en la menor mortalidad general de la campaña con respecto á la Capital; pues por una parte la aglomeración de habitantes y por otra el hecho de que fallecen en la Capital muchos enfermos que vienen á ella desde el interior para asistirse, hacen elevar el coeficiente indicado. Si observamos el coeficiente de mortalidad infantil con respecto á la mortalidad general en varias ciudades, tenemos que por cada 1,000 defunciones se producen antes del año en—

	Defunciones.
Valparaíso, 1909	389
Santiago de Chile	380
Sao Paulo	316
Nueva York, 1908	228
Montevideo, Promedio, 1901–1905	182
Montevideo, 1910	194
Buenos Aires	206
Rosario	281
Rio Janeiro	223
Santa Fe	278
Berlín	231
Breslau	270

LA MORTINATALIDAD RELACIONADA CON LA NATALIDAD Y CON LA MORTALIDAD GENERAL.

El cuadro 14 pone bien de manifiesto que el número de nacidos sin vida, relacionado con los nacimientos, es sensiblemente constante á cada 100 nacidos con vida corresponden 4 nacidos muertos.

Esta cifra presenta lingeras oscilaciones, variando entre 3.7 en 1904 y 4.6 en 1906. La principal causa que produce la muerte en el momento de nacer, la constituyen los accidentes obstétricos y por tanto se comprende que la profilaxia consistirá en que los partos sean atendidos sólo por parteras diplomadas y en que éstas obtengan con el título que las habilita para ejercer, una preparación suficiente.

Es indudable que no debe ser esta causa más importante, por cuanto la cantidad de nacidos sin vida es mayor en Montevideo que en la campaña, aun cuando es de suponerse que en la Capital las parturientas deben ser mejor atendidas que en el norte del país. Tenemos en efecto en 1910 en Montevideo, 4.2 nacidos muertos por 100 nacimientos y en la campaña 3.4. Tal vez pueda explicarse este resultado contraditorio suponiendo que las cifras que arroja la estadística de la campaña sea inferior á la realidad. Es muy posible que en muchos

casos de nacidos muertos, sobre todo teniendo en cuenta lo difícil que son las comunicaciones en cierta época del año en algunos Departamentos de nuestro país, que el hecho no se lleve á conocimiento de las autoridades y de este modo su número tal vez considerable no figure en la estadística. Si relacionamos ahora la mortinatalidad con la mortalidad general, tenemos que en Montevideo constituye el 6.8 por ciento de la mortalidad general y la República en el 7.91 por ciento.

He aquí algunas cifras correspondientes á algunas ciudades conocidas:

	Por ciento.
Milán	4.4
Hamburgo	5.1
San Petersburgo	5.5
Berlín	5.9
Leipzig	6.58
Amsterdam	7.5
Buenos Aires	9.6
Trieste	10.3
Río Janeiro	11.5
Viena	12.7

Como se ve, ocupamos una posición bastante satisfactoria en esta lista.

Cuadro No. 16.

La natalidad relacionada con la mortinatalidad en Montevideo en el decenio 1901–1910.

A. Años.	B. Nacimientos.	C. Nacidos muertos.	$\frac{100\,c}{b}$ Nacidos muertos por 100 nacimientos.
1901	7,824	343	4.3
1902	7,834	353	4.5
1903	8,080	327	4
1904	7,702	290	3.7
1905	7,709	325	4.2
1906	7,980	367	4.6
1907	8,350	364	4.3
1908	8,819	404	4.5
1909	9,363	374	4
1910	9,486	406	4.2

Promedio de nacidos muertos por 100 nacidos vivos: Quinquenio 1901–1905, 4.1; quinquenio 1906–1910, 4.3.

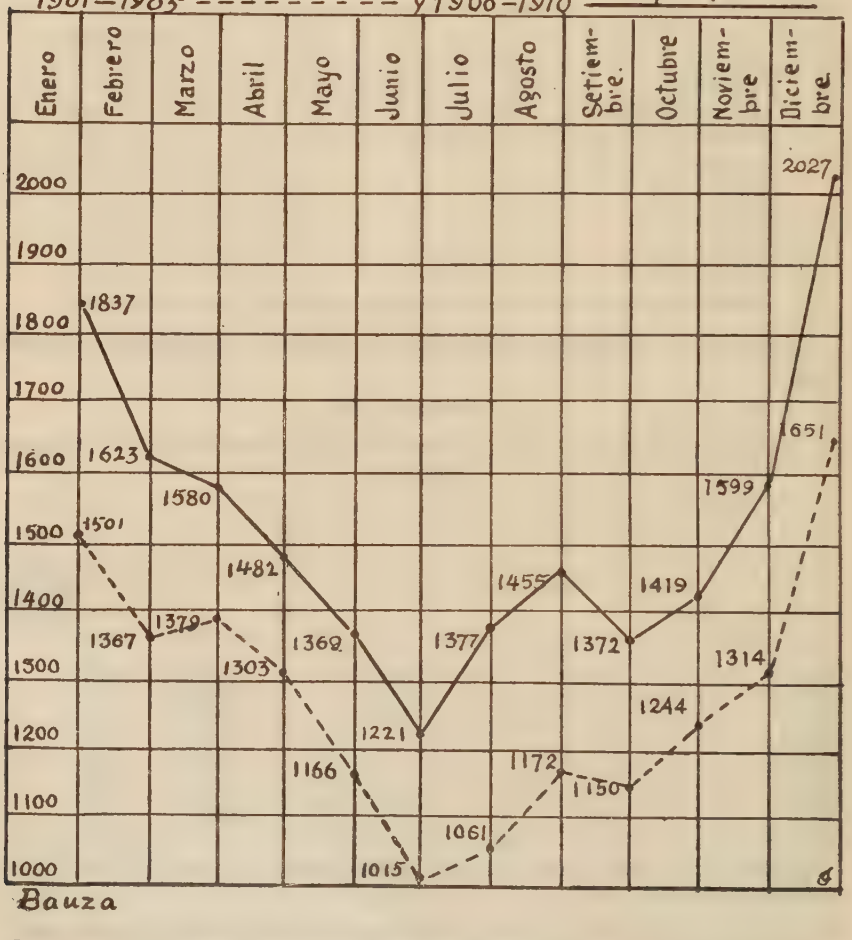
LA MORTALIDAD INFANTIL DE 0 Á 1 AÑO, EN LOS DIFERENTES MESES DEL AÑO, DURANTE EL DECENIO 1901–1910.

El estudio de las cifras que indican la cantidad de defunciones de los niños menores de 1 año, desde enero á diciembre, muestra claramente que la máxima corresponde á los meses de calor: Diciembre, enero, febrero y marzo y que la mínima á los meses de mayo, junio y julio.

Junio es el mes de mortalidad infantil más baja y diciembre el de la más crecida.

La mortalidad infantil en los meses que componen el año, en nuestro país, puede representarse con bastante precisión como una V, correspondiendo á los extremos superiores los meses de enero y diciembre, y al punto de unión inferior de los dos ramos de la V

16. La mortalidad infantil (menores de 1 año) en la Republica del Uruguay, en los distintos meses del año, en los quinquennios: 1901–1905 ---------- y 1906–1910 ———



al mes de junio. Comparando las líneas de los dos quinquenios, vemos que son ambas bastante análogas, ofreciendo un paralelismo bastante aproximado en casi todos los meses, ofreciendo sin embargo algunas diferencias sensibles en los meses de marzo y setiembre. La mortalidad del mes de marzo en los cinco años transcurridos, desde 1901 á 1905, es algo inferior á la de febrero, mientras que durante el período 1906 á 1910 es ligeramente superior.

CUADRO No. 17.

La mortalidad infantil de menores de 1 año á los distintos meses desde 1901 á 1910.

Año.	Enero.	Febrero.	Marzo.	Abril.	Mayo.	Junio.	Julio.	Agosto.	Septiembre.	Octubre.	Noviembre.	Diciembre.
1901 á 1905	1,501	1,367	1,379	1,303	1,166	1,015	1,061	1,172	1,150	1,244	1,314	1,651
1905 á 1910	1,837	1,623	1,580	1,482	1,369	1,221	1,373	1,455	1,372	1,419	1,599	2,027
Total	3,338	2,990	2,959	2,785	2,535	2,236	2,434	2,627	2,522	2,663	2,913	3,678

La mortalidad del mes de setiembre en el quinquenio 1901–1905 es inferior á la del mes de agosto, mientras que en el quinquenio 1906–1910 es inferior. En cuanto á la mortalidad del mes de diciembre, comparado en los dos quinquenios revela un aumento extraordinario y en desacuerdo con el aumento natural producido por la mayor natalidad en el quinquenio 1906–1910.

De aquí puede inferirse que la mortalidad por enfermedades de verano, gastro-enteritis ó análogas, tiende á elevarse considerablemente, y que la producida en los meses de invierno, enfermedades bronco-pulmonares, es sensiblemente la misma. En efecto, mientras la mortalidad de junio de 1906–1910 excede en un 20 por ciento á la de 1901–1905, la de diciembre le es superior en un 23 por ciento; es decir, que por 100 defunciones en el mes de junio desde 1901 á 1905 se producen 120 desde 1906 á 1910, aumento proporcionado al de la población, y por 100 defunciones producidas en diciembre en el quinquenio 1901–1905 se producen 123 en el quinquenio 1906–1910; el cual demuestra la consideración hecha algo más arriba.

NATALIDAD, MORTALIDAD GENERAL Y CRECIMIENTO VEGETATIVO DEL URUGUAY, COMPARADO CON OTROS PAÍSES (1908).

La República del Uruguay ocupa una posición intermedia entre los de natalidad más elevada y más baja. En efecto, entre Rusia con un coeficiente de 44.1 nacimientos por 1,000 habitantes y Francia con 20.2; el Uruguay con 32.4 ofrece el término medio casi exacto. De 23 países que figuran en la tabla que va á continuación, el Uruguay ocupa el 11 onceno puesto. Pero como su coeficiente de mortalidad general de 14.6 es el más reducido después de Noruega, resulta que su crecimiento vegetativo es de los más altos, 17.8 por 1,000, sobrepasado sólo por Bulgaria con 21.3 y algo superior al de la República Argentina que sigue inmediatamente con 17 por 1,000.

Por consiguiente no son los países de natalidad más elevada los que ofrecen un crecimiento vegetativo mayor; no hay más que leer

las cifras correspondientes á Rumania y á Chile para ver que á pesar de su fuerte natalidad, ofrecen debido á mortalidad elevadísimas cifras de crecimiento vegetativo relativamente mínimo, pero que sin embargo es siempre de cierta importancia. En cambio los países de débil natalidad como Francia é Irlanda, por ejemplo, tienen un crecimiento casi nulo, 5.7 por 1,000 para Irlanda, 1.2 para Francia.

Si del estudio de los países pasamos al de las ciudades, observaremos el cuadro que sigue que de una lista de 33 ciudades conocidas por su importancia, Montevideo ocupa el duodécimo término en lo referente á la natalidad; es decir, que hay 11 ciudades de las mencionadas en la lista que poseen una natalidad mayor y hay 22 que tienen una mortalidad menor.

Su crecimiento vegetativo, siendo la diferencia entre 28.7 y 18.6 en 1910, fué de 10.1 por 1,000 habitantes, es sobrepasada por 13 ciudades de la lista.

No debe olvidarse sin embargo que la mortalidad general de 1910 fué extraordinariamente alta, teniendo en cuenta que en años anteriores el promedio era de 15 por 1,000.

En la lista que publicamos, observamos como el relativa á los países, que ciudades como Moscou y Valparaíso que poseen una fuerte natalidad, tienen también una mortalidad tan elevada que anula casi por completo á la primera, determinando un crecimiento vegetativo apenas apreciable, y que la ciudad de Santiago, Capital de la República de Chile, ofrece el particular, que se presta por cierto á muy tristes consideraciones, de que con una natalidad de 34.6 por 1,000, posea una mortalidad de 39.6 que excede por lo tanto en 5 unidades á la primera.

Es una ciudad por tanto que ofrece un decrecimiento vegetativo de 5 por 1,000.

No nos extrañará este dato, si consideramos la cifra aterradora de su mortalidad infantil.

De las ciudades que poseen una menor natalidad, no debe dejar de mencionarse París, Lion y Ginebra. En estas tres ciudades la mortalidad es casi igual natalidad, y por tanto su crecimiento vegetativo es sensiblemente igual á 0.

CUADRO No. 17.

Índice de natalidad, de mortalidad general y de crecimiento vegetativo en 1908, por 1,000 habitantes.

Países.	Natalidad.	Mortalidad.	Crecimiento vegetativo.
Rusia	44.1	27.7	16.4
Costa Rica	43.1		
Bulgaria	43.6	22.3	21.3
Rumanía	40.8	27.8	13
Chile	39.2	31.6	7.6
República Argentina	38	19	17
Hungría	36.3	24.8	11.5
Austria	33.8	22.6	11.2
Italia	33.4	22.6	10.8
España	33.2	23.3	9.9
Alemania	32	18	14
Uruguay	*32.4*	*14.6*	*17.8*
Holanda	29.7	15	14.7
Venezuela	31.1	25.1	6.03
Dinamarca	28.7	14.7	14
Escocia	27.2	16.1	11.1
Suiza	27	16.2	10.8
Inglaterra	26.5	14.7	11.8
Noruega	26.2	14.3	11.9
Brasil	26.1	19.3	6.8
Suecia	25.7	14.9	10.8
Irlanda	23.3	17.6	5.7
Francia	20.2	19	1.2

CUADRO No. 18.

Natalidad, mortalidad y crecimiento vegetativo por 1,000 habitantes, en varias ciudades, en el año 1910.

	Natalidad.	Mortalidad.	Crecimiento vegetativo.
Rosario de Santa Fe	40.9	21.4	19.5
Valparaíso (1909)	40.1	34.2	5.9
Santa Fe	38.8	26.1	12.7
Moscou	35.3	29.5	5.8
Coruna	34.9	23.8	11.1
Santiago (1909)	34.6	39.6	
Buenos Aires	34.2	16	18.2
Trieste	32.1	22.5	9.6
Bilbao	31.7	20.7	11
Bucarest	30.7	26	4.7
Liverpool	30	17.7	12.3
Montevideo	*28.7*	*18.6*	*10.1*
Dublin	28.3	21.1	7.2
Río Janeiro	27.8	20.6	7.2
Manchester	27	16	11
Nueva York	26.8	15.8	11
Nuremberg	26.7	14.8	11.9
Burmingham	26	13.6	12.4
Conpenhague	26	14.3	11.7
Bremen	26.1	14	12.1
Leipzig	24.2	13.7	10.5
Hamburgo	23.9	14.9	8.9
Roma	23	18.5	5
Stuttgart	23.2	14.1	9.1
Munich	22.9	16.2	6.7
Venecia	22.5	18.5	5
Milan	22.4	17.1	4.7
Viena	20.7	15.6	5.8
Amberes	20.2	12	8.2
París	18	16.7	1.3
Lion	17.4	17.7	0.37
Bruselas	11.8	13.6	3.1
Ginebra	14.9	13.3	1.6

BIBLIOGRAFÍA.

Resumen Anual de Estadística Municipal, Montevideo.
El Movimiento del Estado Civil y la Mortalidad en el Uruguay.
Anuario Estadístico de la República de Chile, 1909.
Anuario Estadístico de la República de Méjico, 1906.
Anuario Estadístico de Sao Paulo, 1908.
Anuario Estadístico de Costa Rica, 1909.
Anuario Estadístico de Venezuela, 1908.
Bericht über der III. Internationale Kongress für Sauglingsschutz.

PROCEEDINGS OF A MEETING OF SUBSECTION ON MENTAL HYGIENE

HELD ON THURSDAY MORNING, SEPTEMBER 26, IN THE PAN AMERICAN UNION.

CHAIRMAN: DR. LEWELLYS F. BARKER,
PROFESSOR OF INTERNAL MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MD.
SECRETARY: DR. GEORGE BLUMER,
DEAN OF THE MEDICAL SCHOOL, YALE UNIVERSITY, NEW HAVEN, CONN.

ACCOUNT OF THE PROCEEDINGS.

The Subsection on Mental Hygiene was called to order by the chairman, Dr. Lewellys F. Barker. Dr. Henry H. Goddard, of Vineland, N. J., read a paper on

The Prevention of Feeblemindedness.

The chairman made an address on

The Scope of Work of the National Committee for Mental Hygiene.

Participants in the discussion were Dr. M. P. E. Groszmann, Miss Maude E. Miner, and Mr. Bleecker Van Wagenen.

Dr. Thomas W. Salmon, of the United States Public Health Service spoke on

The Preventable Causes of Insanity. (No manuscript was furnished.)

Dr. L. Pierce Clark, of New York, read a paper entitled

Notes on the Prevention of Epilepsy.

Those who took part in the discussion were Dr. Eleanor S. Everhardt; Miss Maude E. Miner, of New York; Dr. M. P. E. Groszmann, of Plainfield, N. J.; Dr. J. E. Wallace Wallin, of Pittsburgh, Pa.; and Dr. Seelig, of Berlin, Germany.

Dr. Woods Hutchinson spoke on

Limitations and Fallacies in the Education of the Feebleminded. (No manuscript was furnished.)

THE PREVENTION OF FEEBLE-MINDEDNESS.

Dr. Henry H. Goddard, Vineland, N. J.

Formerly feeble-mindedness meant idiocy or imbecility, a condition bad enough, it is true, but not presenting the urgent need of control which we now feel comes from a better understanding of feeble-mindedness.

We have recently discovered that there are very many feeble-minded persons who are not recognized by the ordinary observer. They do not show any of the stigmata of degeneration, and are not found out until they have done something wrong. Even then their wrongdoing is more often attributed to willfulness than to inability to do right. Careful studies have shown that there is a group of people above the imbecile, but nevertheless truly feeble-minded, who are thoroughly irresponsible for the acts that they commit, "who can not compete on equal terms with their fellows, or manage their own affairs with ordinary prudence;" in short, are incapable of living an independent existence, but must always be dependent upon others. Not only has it been clearly demonstrated that there is such a group as this, but it has been shown that the number of them is vastly greater than anyone suspected.

It is a conservative statement to declare that 2 per cent of public-school children are distinctly feeble-minded, the larger part of them belonging to this high-grade group which we call morons. If a new disease were to appear and sweep away 2 per cent of our children, we would immediately set to work to prevent that disease. Here we have a condition affecting 2 per cent of the children, not, indeed, destroying their lives, but rendering them incapable of living with the rest of us on equal terms. Still more formidable is the fact that this condition is hereditary and directly transmitted from father or mother to child.

At least 65 per cent of all feeble-mindedness is hereditary. The low grade of intelligence which characterizes the feeble-minded can only result in their living shiftless, useless lives, spreading disease, because they are unintelligent in the matter of warding it off and avoiding it; and, lastly, in their breeding like animals. The Royal Commission of England found, upon investigation, that this type of person was increasing at twice the rate of the general population. A remarkable family investigated at the Vineland Training School, and described in a book recently published by the Macmillan Co., shows

that six generations ago a man had two wives; the first was feeble-minded, and bore him a feeble-minded son; the second was a normal woman, and bore him six children. All of these, the feeble-minded son and six normal children, married and had children; the one, a line of mental defectives, and the others, of purely normal and respectable people. To-day the lineal descendants of the one feeble-minded son number 480, while the descendants of the six normal children of this marriage number 496. In other words, the feeble-minded branch of this family, starting from one ancestor, now numbers practically the same as the good branch, starting from six. It is easy to see that, unless feeble-mindedness is prevented, the feeble-minded people will in time outnumber the normal, and the burden will be greater than can possibly be borne.

But we do not have to look into the future to discover danger ahead. The feeble-minded person is a menace to society at the present moment. Many of our States are expending from one-fourth to one-half of the money raised in taxes on their defectives and delinquents, the pauper, the criminal, the prostitute, the drunkard, and the ne'er-do-well. And this amount takes no account of the cost of repairing the damage that is done by these persons, even in those cases where it can be repaired. Although we are lacking in those careful studies which give us exact statistics in all these lines, yet there is every reason to believe that from a quarter to a half of our criminals are feeble-minded. It is stated that a recent study of the inmates of the Elmira Reformatory, in New York, shows 65 per cent of them distinctly feeble-minded. Of the girls and boys in our reformatories, at least 25 per cent are feeble-minded.

Studies made for other purposes have, incidentally, shown that a very large proportion of drunkards are feeble-minded, and are drunkards because they are feeble-minded. Careful observation has convinced many workers that a large proportion of prostitutes are mentally defective and have easily been led into this life because of their natural impulses and their lack of intelligent control of them. Examination of the inmates of our almshouses will show that a large percentage of these also are mentally defective. In other words, if we could stop the creation of mentally defective persons in our society, we would reduce enormously our expenses in caring for our dependents. We put this on a financial basis, because here it can be estimated. No estimate can be made of the moral damage of the influence of these people in the community. If it is desirable to prevent feeble-mindedness in order to reduce the expenses of our commonwealth, it is much more desirable to prevent feeble-mindedness in order to save the moral contagion that results.

Our studies at Vineland have shown large communities honeycombed with mentally defective populations who are all related, all

belonging to one or two degenerate defective families. Such conditions will be found all over the country in every State of the Union. How many of them, no one knows.

Feeble-mindedness must be prevented. How?

I shall not take up your time discussing how to prevent the 35 per cent of cases that are not hereditary, but are due to disease, to accidents, or something of that kind. These cases are more often of the lower type, and are usually cared for and live out their lives, and the matter is ended.

I shall confine myself to that far more dangerous and serious group of high-grade defectives who often pass for normal, and thus get placed in responsible positions where their failure to function properly results in great loss or damage or crime, and who at the same time marry and continue the race of defectives.

How shall we prevent this group of feeble-mindedness?

There are two solutions proposed: One is colonization; the other, sterilization.

Segregation through colonization appears to be the ideal method. It does not have any incidents or consequences that shock our sentiments or seem objectionable. These persons are picked out as early in life as possible, and removed to a large farm or institution, preferably in the country, where the sexes are kept apart. They are trained and educated in those things that they can learn, and, under the guidance and direction of more intelligent leaders, they are made more or less self-supporting. They live their lives in happiness and partial usefulness, and finally pass off the stage of action without having left any descendants to be cared for. It is estimated that, after a generation or two, our problem would be reduced to at least one-third of what it is at present. But the difficulty here lies in the fact that the situation has already gotten ahead of us.

One has only to estimate 2 per cent of the school population in any State to discover that it is practically impossible for us to finance the proposition of segregating and colonizing feeble-minded persons. But even if we arose to the occasion and raised the money necessary to provide for this, we would still be reckoning without our host. Many of these people are such high-grade defectives that the parents do not recognize the condition, and even if they do, will not consent to their being taken by the State and segregated for life. It does not seem likely that we will soon come to the point where society will forcibly take these children away from their parents and colonize them. Therefore, the permanent custodial care is not a feasible solution of the problem. We must go on colonizing and segregating as many as possible, doing what good we can in that

way. But there is a large residue left over that must be provided for in some other way.

To help in the solution, sterilization has been proposed. This, as a rule, appeals to people as a quick and ready and easy solution of the difficulty, and many individuals apparently believe that if all of our States had sterilization laws the problem could be quickly solved. More experience and a deeper study of the situation reveals the fact that here again we are balked at many turns, and that the method is not adequate. Eight States now have laws allowing for the sterilization of certain persons under certain conditions. In all cases these are inmates of various State institutions for the feeble-minded and of our prisons and insane hospitals. The matter is in the charge of a commission who have power to go to the institution and demand the history and status of the various individuals and then authorize the operation on such as in their judgment are incurable and likely to transmit the condition to their children. It will be noted that, so far as the feeble-minded part of the problem is concerned, these are children already in institutions for the feeble-minded. What does their sterilization mean? It means that the institution can be a little less alert in keeping the sexes apart, and that a very small percentage who are capable (because they have been trained) of earning a living out of the institution may now be discharged and sent out to earn their own support, or sent home to parents who may now be trusted to take care of them, since they are sexually safe. Perhaps from 1 to 5 per cent of the inmates of our institutions might be thus be sent home and the burden of their expense removed from the State. In their places others will be taken into the institutions, some of whom can again be trained and sterilized and sent home. But unless care is taken in the selection of the cases this process will soon come to an end, and the institution will be filled with those who are untrainable or who can not be sent out, even if they are sterilized, and so nothing will be gained for society by the sterilization.

There is one way to utilize this law so as to make it of considerable importance toward solving the problem. Before discussing this we must consider some objections to the sterilization process, because, to make any wide use of it, it must be accepted as a satisfactory procedure.

The method of sterilization now generally advocated—and in some States the only one allowed by the law—is vasectomy or salpingectomy. This consists not in the removal of any organ, but in the severing of the essential tubes which convey the germ cells from the organs in which they are produced. These tubes once severed, the germ cells can not find their way to the proper place, and consequently can never unite for the production of offspring. The operation is

simple and harmless and could even be performed without the subject knowing what had happened. There is no mutilation as in the older form of unsexing, which is so strongly objected to by many people.

On the other hand, the new form of sterilization has no other effect than to make procreation impossible. It does not remove the desire for sexual congress. On this account it is objected to by very many, who argue that if persons thus rendered incapable of procreation are turned loose in the community, they will become centers of debauchery and disease; that they will be sought out by persons who would otherwise remain virtuous, and thus will become dangerous elements in any community. In answer to this it may be said that the very meager data that is as yet available does not justify these fears. Secondly, it must be remembered that there would not be a large number of these in any community, and the few that there were could easily be controlled by an enlightened public. So far as disease is concerned, the matter could be put in the hands of the board of health and easily taken care of. So far as these persons themselves are concerned, they would undoubtedly be no more active than formerly, since these feeble-minded people never exercise any control under any conditions, and the removal of the fear of consequences would make no difference in them.

It seems highly probable that this objection is fanciful and not one that would prove serious in actual practice. If, then, we allow that the operation itself is satisfactory, our next problem is how shall we practice it under the law so as to make it most efficient toward the solution of this terrific problem of preventing feeble-mindedness. I say under the law, because it seems we must act under the present law and can hardly hope for a more drastic one. It is with considerable difficulty that even these laws have been obtained, and several States have rejected even them, so we can hardly hope for a time soon when we may have a law that will authorize some kind of a commission to sterilize any child that they deem feeble-minded, whether he is in an institution or not. But what we can do is to lay a definite plan whereby we may see to it that children from those families where this condition is demonstrated to be hereditary shall systemmatically be placed in institutions long enough for them to be operated upon and then allowed to go back to their homes. And thus, by definitely and consciously providing that there shall be a constant stream of defective persons going in, being sterilized, and sent out, we can, in a short time, have considerable effect upon the situation. In the light of our present knowledge of the problem and means of dealing with it, this seems to be the next step.

In those communities and among those people where such a procedure still seems unnecessary or undesirable, a campaign of education must be waged. It is only necessary for competent persons to

make a reasonably careful investigation of conditions as they exist in almost any community and publish those results for the people to at once discover that here is a condition of things that must be stopped.

One or two other objections may be considered before closing this paper. In many cases it is thought that the law is unconstitutional. Perhaps I need here say nothing further on that subject than that the Supreme Court of the State of Washington has recently decided that the law is constitutional. This probably will go a long way toward determining the action of other States.

A less serious objection, but one that is sometimes heard, is that in thus stopping procreation in these families and cutting off the stream of defectives, we may be preventing the birth of geniuses, since genius is supposed to be somehow bound up with mental deficiency, in the sense that one child may be mentally defective and another one in the group a genius. If this were so, then one would need to ask the question, How many geniuses do we demand in order to compensate us for the horrible conditions that we are finding in these families that are feeble-minded and normal in the ratio of 4 to 1? But there is no evidence that such is the fact. In the investigations at Vineland of over 400 feeble-minded children and their ancestors, there has never yet been found a genius in any one of these families where heredity is the cause. If there is any foundation for this popular superstition, it is more likely to be in the connection between genius and insanity, but that has nothing to do with our present problem.

Finally, to those who still object to the proposal here made, there is only one answer. Let us study the problem from all standpoints. The writer is quite as willing as any objector to wait until we have further data on this problem before taking active steps; only let us proceed to study. Let us learn the facts, in order that we may deal wisely with this matter, which we now know is a serious problem.

THE SCOPE OF THE WORK OF THE NATIONAL COMMITTEE FOR MENTAL HYGIENE.

LEWELLYS F. BARKER, M. D., President of the National Committee for Mental Hygiene, Baltimore.

It is right that, in an International Congress on Hygiene and Demography, the subject of mental hygiene should have especial representation. Though assigned, as a subsection, to the section on the hygiene of infancy and childhood, thus emphasizing its relations to inheritance on the one hand and to the early environmental

period of the individual on the other, it might almost equally well, for other reasons, have been made a subdivision in any one of the main groups of the congress. Indeed, so important is this subject for the welfare of individuals, of families, of communities, of nations, and of the human race in general, and so widespread its ramifications, that committees on the organization of future congresses might well consider the establishment of an additional main section, devoted entirely to mental hygiene.

By a campaign for mental hygiene is meant a continuous effort directed toward conserving and improving the minds of the people; in other words, a systematic attempt to secure human brains, so naturally endowed and so nurtured that people will think better, feel better, and act better than they do now. Such a campaign was not to be expected before the rise of modern medicine. For only with this rise have we come to look upon states of mind as directly related to states of brain, to view insanity as disordered brain function, and to recognize in imbecility and in crime the evidences of brain defect. The imbecile, the hysterical, the epileptic, the insane, and the criminal were formerly regarded sometimes as saints or prophets, sometimes as wizards or witches, often as the victims of demoniac possession, on the one hand to be revered or worshiped, or on the other to be burned or otherwise tortured. Now, such unfortunates are looked upon as patients with disordered or defective nervous systems, proper subjects of medical care; some of them are curable; some are incurable, but still educable to social usefulness; a part of them are socially so worthless, harmful, or dangerous as to make their exclusion from general society necessary or desirable.[1]

It is but a short step from such a reformation of ideas to the realization that less-marked deviations from normal thought, feeling, or behavior are also evidences either of brains defective from the start or made abnormal in function by bad surroundings or by bodily disease. As examples of such less-marked abnormalities may be mentioned those met with in children who are difficult to educate, in young people arraigned in the juvenile courts, in adults who, inadequate to the strains of life, crowd our hospitals or sanitaria on account of "nervous" or "mental" breakdown, or who, owing to anomalies of character and conduct, provide material for the news columns of the sensational press. Modern medicine has taught us to recnize that the conditions necessary for a good mind include, first, the inheritance of such germ plasm from one's progenitors as will yield a brain capable of a high grade of development to individual and social usefulness, and, secondly, the protection of that brain from injury and the submission of it to influences favorable to the development of its powers. Now, if these doctrines of modern medicine be true, the general problems of mental hygiene become obvious;

broadly conceived, they consist, first, in providing for the birth of children endowed with good brains, denying, as far as possible, the privilege of parenthood to the manifestly unfit—that is to say, the problem of eugenics; and, second, in supplying all individuals, from the moment of fusion of the parental germ cells onward, and whether ancestrally well begun or not, with the environment best suited for the welfare of their mentality. The natural sciences are built up by the gradual discovery of causal relationships; and physicians and psychologists have, since the time of Pinel, gone far in the establishment of the laws underlying normal and abnormal phenomena of mind. From the conviction that a proper application of the facts already discovered can vastly improve the mental powers of our people, decreasing to a very large extent the prevalence of mental defect and mental disease, has come the impulse to arouse public opinion in favor of a definite plan for mental hygiene. This impulse, thanks to the initiative of a layman, Mr. C. W. Beers,[2] author of a Mind that Found Itself, whose personal sufferings led him, on recovery, to devote himself to the cause of mental hygiene, and who enlisted the cooperation of a group of representative medical men and social workers, has found expression in the voluntary formation of a national committee for mental hygiene. This committee was founded at a meeting held in New York City February 19, 1909, when the following officers were appointed for the first year: President, Dr. Henry B. Favill; vice presidents, Dr. Charles P. Bancroft and Dr. William H. Welch; executive committee, Dr. Adolf Meyer (chairman), Dr. C. P. Bancroft, Prof. Russell H. Chittenden, Prof. William James, and Miss Julia C. Lathrop.[3] Among its objects may be emphasized: (1) The protection of the mental health of the public at large: (2) the promotion of the study of mental disorders in all their forms and relations, and the dissemination of knowledge concerning their causes, treatment, and prevention; and (3) the amelioration of conditions among those already suffering from mental disorders.

As I see it, there are three great fields in which the national committee may advantageously labor.

First, there is the field of original inquiry regarding the problems of mental hygiene. A national committee, adequately endowed, could support and direct the investigation of special questions by experts, thus adding to the knowledge which can be applied in the more practical part of the campaign. This work of research is very costly. Were they available, immense sums could be used for studying the influences of heredity and of external circumstances upon the structure and functions of the human nervous system. Meanwhile a national committee composed of leaders of thought among the men and women of the country can do much to favor such studies by

university departments, by existing institutes of research, and by other agencies already organized.

The second field includes the great work of educating the nation to use the knowledge which scientific investigators have already put at our disposal. In this field, three powerful enemies oppose us—ignorance, apathy, and prejudice. These hostile forces we must overcome. They will retreat, as they always do, before the attack of men and women armed with accurate knowledge of facts and energized by the emotions which accompany visions of remediable evil.

In this campaign of education the general public, physicians, school-teachers, the clergy, members of the legal profession, our legislators—all must be taught the particular truths regarding mental hygiene which each group, respectively, can best apply.

Only a minority of the public knows and realizes that the kind of mind an individual has depends upon the inborn qualities of brain he inherits and the influences which act upon it afterwards; that not only imbecility, insanity, and epilepsy are due to disordered or defective nervous systems, but that, further, inebriety, prostitution, vagrancy, pauperism, and crime have the same origin, as do also ineducability, laziness, and other forms of mental disability. Not many know that 40 to 50 per cent of all severer cases of mental disorder are due to known and well-defined causes, preventable by means with which we are now acquainted; that 25 per cent of the patients admitted to institutions for the insane, and a large proportion of the criminals in confinement have brains that have been injured by the abuse of alcohol; and that all general paresis and much mental disorder of other sorts has been preceded by syphilitic infection, usually insufficiently treated. Only a few are aware that there are already about 250,000 insane people in the United States to-day, and that the number is increasing at the rate of 3 or 4 per every 1,000 of increase of population. Not enough people realize that if two imbeciles marry all their children will be imbecile, or that when imbeciles marry normal persons about half the total offspring are feeble-minded or degenerate. Nor as yet has it been possible to impress the public with the facts that the social stigmatizing of the insane is cruel and unreasonable; that suicide, occurring as a result of a psychopathic constitution, should excite the sympathy rather than the moral judgment of those who think humanely; that early treatment of insanity in suitable institutions leads to complete recovery in at least 25 per cent of the cases; or with a thousand other facts that ought to be known and realized.

How are the important data regarding the protection of the mental health of the public to be made available to them? This is one of the problems to be solved. Much can doubtless be done through the dissemination of suitable books and pamphlets, through sensible

articles in magazines and newspapers, through public lectures, through "mental hygiene exhibits" such as the admirable one organized by the National Committee of Mental Hygiene under the supervision of Dr. Stewart Paton for this congress, through teaching in the schools, churches, and social clubs; most of all, however, through the advice of family physicians, who more than others have opportunity to be practically effective in giving wise counsel.

This brings me to the education of physicians. The instruction in psychiatry in our medical schools is sadly deficient. Though in Germany each university has for many years had its psychiatric clinic, it was not until recently that a single medical school in this country had a well-equipped clinic of this sort. Now the outlook is better. At Ann Arbor medical students have for several years had the privileges of a small clinic conducted along the newer lines. At Boston the new State psychopathic hospital will be available for educating students regarding the manifestations of mental disease. And lately, at the cost of over $1,000,000 given by Mr. Henry Phipps, a model psychiatric clinic has been erected in connection with the Johns Hopkins Hospital and University and its maintenance guaranteed for the coming decade. It can not be long now before every medical school of the first class will have its own psychiatric clinic. The teaching in these clinics will undoubtedly lead to great reforms in the treatment and in the prevention of mental diseases. The national committee may be of service in hastening the advent of such psychiatric clinics. It intends to keep on file all needed information regarding them, as well as plans of model clinics, sanitaria, hospitals, etc., which will be accessible to institutions or to community officials who may desire to consult them.

When physicians are better trained in psychiatry they will be even more helpful than now in counseling regarding the marriage of people with psychopathic tendencies concerning the hygiene of pregnancy, of birth, of childhood, of puberty, and of the climacteric period in relation to the education of backward or of peculiar children and with reference to dietetic, sexual, and occupational hygiene. They will also learn to recognize mental disorders earlier than now—that is, at a stage where many of them are curable—and will do much toward overcoming the prejudices of the people against referring the more serious cases to expert care in suitable institutions.[4]

The teachers in our schools and colleges should gladly join in a campaign for mental hygiene, and they themselves will welcome instruction which will help them in their pedagogic problems, for teachers have been among the first to notice among children great differences in degree of educability by ordinary methods. Until the reasons were made clear, some teachers unjustly blamed children slow to learn; other teachers, discouraged, unjustly blamed

themselves. Here scientific medicine has come to the aid of pedagogy. School physicians are becoming more expert in distinguishing between inborn and acquired defect, between remediable and irremediable difficulty. The establishment of special classes and of special schools for "feebly endowed," "backward," and "exceptional" children is removing a great burden from the schools and the teachers. Special opportunities are being created, new methods are being devised, through which such children can be favorably influenced.

As to the need of education of the representatives of the law—lawyers, magistrates, judges, and legislators—anyone who has studied the psychology of criminals and who is at the same time familiar with our laws and our courts attests. Since psychiatrists have had the opportunity thoroughly to observe and study criminals before, during, and after punishment, our notions of the relations between crime and mental disorder (or anomaly) have been greatly changed. There is a growing tendency to recognize the dependence of criminal as well as of all other acts upon the mental state of the agent, and of the latter, in turn, upon the functions of his bodily organs. The newer knowledge demands a revision of the old problems of responsibility, of testamentary capacity, and of the nature and purpose of punishment. Above all, the new insight into facts can be valued for opposing and preventing crime. For since we no longer believe that every man at every moment is entirely free to act or not in a given way, but have come to realize that the behavior of a given moment may be a matter of necessity, we have begun to see that to prevent criminality we must bring influences to bear—social, economic, or medical—that will modify the mental factors driving individuals to antisocial acts. It will be a great step forward when all offenders brought before the juvenile court shall, after skilled psychiatric examination, be assigned to environments that will do most to educate them to social usefulness. Criminals, young or old, incapable of education to social value, society will learn permanently to exclude. That the scandal which has pertained to "expert" medical testimony in the courts must quickly disappear, once a real campaign of mental hygiene has made headway, goes without saying; and that in the revision of our law codes, particularly of its criminal code, specialists in psychiatry should cooperate with the best legal talent would seem obvious. Toward the spread of these ideas a national committee of mental hygiene should be able to do much.

Indispensable for accomplishment in the two fields already mentioned—those of investigation and of education—is activity in a third great field, that of organizing the agencies by which the campaign is to be carried on. The bulk of the work must be done by indi-

viduals and by local and State societies. An excellent beginning has been made by the State Charities Aid Association in New York and by the State Societies for Mental Hygiene, organized in Connecticut and in Illinois. To encourage the work of such associations, to stimulate the foundation of similar agencies in every State of the Union, and to coordinate and to give impetus to the work of the campaign throughout the whole country will be among the principal functions of the national committee. And while correlating the work of such agencies, the national committee will make every effort to cooperate with other national and international associations with allied philanthropic aims—eugenic, euthenic, pedagogic, sociologic, legislative. It will join in the general warfare against poverty and all the forms of social injustice which tend to unhinge the mind.

If the national committee for mental hygiene is successful in making of itself a strong central agency devoted to the objects mentioned, it will serve a function of fundamental importance to the whole American people. For if local communities remain backward in mental hygiene they must sooner or later injure more advanced distant communities. By keeping all the States informed of the plans of work adopted where progress is making fastest, advances can be made more rapidly, more uniformly, and more economically than would be otherwise possible. A representative national committee should be able to secure that nation-wide attention to the problems which is necessary for any steady advance toward those higher ideals of mental hygiene which we cherish. It is conceivable that Congress may be induced to supplement private funds in support of a movement of such national significance. It would be a good policy. Indeed it may in time become desirable to have the kind of work planned and begun by this voluntarily organized committee, conducted by a special bureau of the Federal Government. But we can scarcely expect this yet. Like many other forward movements in this Republic, the larger movement for mental hygiene must be initiated and be voluntarily supported by those who see the need and the opportunity long before the consciousness of the masses is aware of them.

To carry out its plan the national committee for mental hygiene will require large amounts of money. It would be hard to think of any project likely to yield larger returns, even in a material way, on money invested in it. The care of the insane of the Nation, together with the economic loss incurred through incapacity and death, were estimated by C. L. Dana,[5] in 1904, to be about $85,000,000 per year. If we add to this the expense borne by society because of the feeble or abnormal minds of criminals, inebriates, paupers, and social parasites generally we see what enormous sums could annually

be saved by applying methods which will prevent mental anomaly and defect or which will restore working capacity and economic independence to those suffering from mental disorders.

It is hoped that the various phases of these problems will appeal to patriotic citizens who are well to do and who are willing to give of their surplus to better the minds of our people. To some philanthropists the endowment of original investigation will most appeal; to others, the support of educative measures; to still others, the defraying of the expenses of the work of organization. One gentleman, well known for his devotion to the public welfare, has contributed $50,000 to the committee for the "amelioration of the conditions of the insane," and this amount has made possible the special work of a "special committee on the survey and improvement of conditions among the insane."[6]

The work of ameliorating the conditions of the insane is very important, and the committee rejoices in a gift that permits a beginning in that direction. But its members hope that before very long large gifts may become available also for the very important matter of prevention. Sums of any size will be welcomed by the treasurer[7] of the national committee or by the chairman of the finance committee.[8]

The task which the national committee for mental hygiene has set itself is an enormous one. It hopes, by investigation, by education, and by organization steadily to improve the brain power of the Nation. It is striving to hasten the time when our people will be so begot and so reared that their minds will develop normally and harmoniously; when society will have less need than now for sanitoria, asylums, and prisons; and when all but an irreducible minority of those born to membership in the Nation may think, feel, and act in a way that will make them desirable citizens of that Better State which is our goal.

It is a great task, but surely not too great for the country that produced George Washington and John Marshall and Abraham Lincoln, or for the parents of a people to whom belong Benjamin Franklin and Willard Gibbes and Ralph Waldo Emerson.

DISCUSSION.

Dr. Maximilian P. E. Groszmann, Plainfield, N. J.: In commenting upon the excellent address of the chairman, I wish to emphasize his remark that the principal thing to consider is prevention. We understand that the only thing to do with the small group of children who are uneducable is to segregate them and place them under permanent institutional care. We must realize that they do not constitute a public-education problem at all, and that we must not shun the burden of dealing with them in the public school. But there is that much larger number of exceptional children who suffer from reme-

diable and removable causes. There are economic handicaps; there are incurable diseases or other physical defects; there is maladjustment of educational systems and methods; there is a large number of causes which will make these children fall by the wayside and eventually suffer, mentally and morally, unless they are understood and cared for in time. We must therefore concentrate our attention upon helping those who can or must be helped, while we must be satisfied to develop provisions of segregation for those who can not be helped.

MAUDE E. MINER, secretary of New York Probation Association: Would not a resolution be in order from this section that the United States Government be urged to provide more adequately for mental as well as physical examination of immigrants under already existing laws?

I was told yesterday at the Bureau of Immigration that the lack of provision for sufficient numbers of physicians and interpreters is responsible for this.

BLEECKER VAN WAGENEN: Propaganda for eugenics and mental hygiene can well be promoted by personal presentation of these subjects by those who know the fundamental facts to those who do not know, in groups, or in personal conversation. The public interest is great and growing. Opportunities to tell abound. In speaking to audiences myself I have sometimes strung my remarks on these three words, "know," "care," "do." Open the mind to the wonderful and tremendous facts of life as they are now reported by the scientists and the research worker. Face these facts bravely and sympathetically until the heart responds with an eager desire for better conditions and cries out, "What can I do?" One thing all can do, even if they can do no more—tell others what they have learned. Thus a propaganda develops and grows of itself, and when millions of people are talking about one subject and demanding amelioration or prevention of existing conditions the necessary organizations and legislations are bound to come.

---

[1] Cf. Stier (E.). Die Bedeutung der Psychiatrie für den Kulturfortschritt. Jena, 1911.

[2] Now secretary of the national committee.

[3] The chairman of the executive committee at present is Dr. George Blumer, of New Haven.

[4] Cf. Zingerle (H.). Die psychiatrischen Aufgaben des praktischen Arztes. Jena. 1911.

[5] See Dr. Dana's address before the Congress of Arts and Sciences, St. Louis, 1904.

[6] Of this committee Dr. William L. Russell is chairman, and through it the active services of Dr. Thomas W. Salmon, of the United States Marine and Public Health Service, and the aid of Mr. John Koren have been secured.

[7] Mr. Otto S. Bannard, of New York.

[8] Prof. Russel H. Chittenden, of New Haven.

NOTES ON THE PREVENTION OF EPILEPSY.

L. Pierce Clark, M. D., New York.

If it be admitted, as some contend, that 20 per cent of epileptics have actually no bad ancestry (Gowers), no bad intrauterine or intrapartum history, or suffer infantile insults—in other words, absolutely nothing to explain the occurrence of their disease—then, of course, the influence of various heredity factors upon the procreation of epileptics must be essentially fallacious. The same argument holds true for idiocy and feeble-mindedness. If a perfectly sound child, as far as one may judge, develops epilepsy or idiocy without cause, then there can be no justification for the bold statement that some other child is epileptic or idiotic solely because his ancestry was bad—tubercular, alcoholic, or the like. In some of the careful English statistics there are more epileptics of sound stock than of alcoholic. One might argue therefrom that ancestral alcoholism gave some immunity, though, of course, the contention thus narrowed would be absurd.

The appearance of epilepsy in a family previously sound may be interpreted itself as a phenomenon of degeneracy, thus furnishing an illustration of the old doctrine that it is natural and unavoidable for a given stock to degenerate spontaneously. A society for the study of genealogy, heredity, and regeneration, recently organized in Germany, has announced that prosperity, mere improvement in material welfare, is alone sufficient to cause degeneracy. It is therefore possible that certain factors, commonly regarded as causes of degeneracy, are really effects of the latter. The effects then figure as further causes, and vicious circles result. From this point of view, epilepsy is greatly increased by civilization, which would make it very difficult, however imperative the need, to eradicate it by eugenics. Thus determinists would conclude that epilepsy and like disorders are invariably by-products of civilization.

Degeneracy must be understood in full to bring it into relationship with epilepsy. Its most common manifestations are expressed in low vitality (as seen in stillbirths, congenital debilty, inability of mothers to nurse, high infant mortality, falling birthrate, tuberculosis in early life), psychopathy, defective development in all phases, general inferiority, abnormal sexuality, criminal and other antisocial tendencies, pauperism, weak-mindedness, "genius," etc. In associating epilepsy here, one factor stands out prominently. The epileptic, like some other neuropaths, has in some respects great organic vigor, tenacity of life, etc. The idiopathic epileptic of sound stock, sound body, etc., represents a very high-class degenerate. The only part in him to suffer is the part which develops last—the cortex. From this type, as we descend in the scale, we find an increasing participation of

the anatomical substratum, until gross defects like microcephalus appear. If these surmises are correct, idiopathic epilepsy in the sound would represent primary and practically nonpreventable degeneracy.

Convulsive phenomena referable to the cortex can not be isolated from other cortical phenomena. Whenever various cell elements are aggregated for the performance of various functions, disease of the structure is bound to follow several types. This is seen in skin pathology. If individuals apparently similar have the same kind of skin disease—simple eczema or dermatitis—one subject will show unusual activity of the pigment cells, another of the horny cells, etc. The first one will be left with a deep stain, while the second will show thickening of the horny layer, desquamation, etc. These differences are fundamental, and equally apparent in the cortex. Recently a typical case of epilepsy developed in a sound subject from an electric shock sufficient to kill. The man at once became a serial epileptic, with day and night attacks, and mental failure. Traumatic psychoneurosis and ordinary hysteria could be excluded. The case is believed to be the first on record. The usual result is death, or unconsciousness, followed at times by symptoms conformable to traumatic psychoneurosis. Just why a cortical insult produces epilepsy in one and not in others is unknowable. The practical deduction is that there is no logic in figuring on how to prevent epilepsy alone. But just what other conditions should be grouped with it is difficult to state. For the idiopathic type probably hysteria, psychasthenia, anomalies of character and personality, criminal and sexual degeneracy, and the insane in general, should be included. A mass study of all this material will doubtless bring much more prophylactic indications to light than a study of any one subject. No doubt such an inclusive study would show abundant evidence of primary degeneracy due to civilization.

A group of special interest from the viewpoint of prevention is the potential or latent epileptic of sound stock. His stock, however, is about due to degenerate from natural causes. He may receive a severe blow on the head or go through a severe febrile disease involving the cortex. He may become an epileptic, or may simply show arrested mental development, or may begin to show criminal or other degenerate tendencies. He is the familiar "black sheep" for a time, until others of the stock go wrong. It is, of course, a common thing for a "black sheep's" parents to charge his trouble to a blow on the head or a fever, and this explanation should be just in certain cases. Practically, there is no way of specially preventing blows, falls, and fevers, so here again we are up against the impossible.

In this connection it is impossible to state whether fright or affects alone can precipitate true epilepsy, since many believe one may iso-

late "affect epilepsy" from the true form. This affect epilepsy is, however, very rare. It is believed to occur only in degenerates. Other authorities do not regard all the convulsions of idiots as true epilepsy. They claim that the idiot has an infant's brain, which must be predisposed to eclampsia from reflex causes, such as infants often have.

That epileptics beget epileptics and all types of degenerates has been so well known since Echeverria's time that it requires no further demonstration. It is exactly what we should expect. The cortical convulsive anomaly would naturally be handed down with especial frequency because it is based on some structural peculiarity. Prophylactic data of the greatest significance come into play here. Epileptics must not marry. Especially they must not intermarry with epileptics or other degenerates. On rare occasions, certain epileptics may be allowed to marry sound mates, if they agree to lead perfectly regular lives, and if their children are brought up along certain strict lines. These exceptional cases may be open to criticism. Segregation in colonies naturally prevents procreation. Whether epileptics should be vasectomized, etc., must be decided in the future.

One-third of all idiopathic epileptics have an organic substratum, i. e., a gross anatomic alteration. This probably does not include any so-called focal cases, although it would take in "idiopathic" cases associated with focal lesions. In this one-third, we should expect to find mental defects, so that to prevent epilepsy in such cases would mean nothing. Preventions would apply to the causes of the anatomical alterations, which in some cases are very evident, even if not preventable. Among them would be the effects of birth traumatisms, which are preventable in part. The whole trend of modern obstetrics is toward the prevention of these accidents, and no doubt the management of obstetrics in the great medical centers prevents many cases of this sort, for every effort is made to secure the birth of an intact child. The vast majority of women throughout the world must be delivered by men of limited obstetric attainments and midwives. When the practice of obstetrics is carried on only by properly trained medical men, there should be a distinct reduction in the number of these cases.

"Prevention of epilepsy" finds an attractive field in maternal impressions scientifically interpreted, and in procreation under vicious circumstances. Maternal impressions should be operative only in the embryonal period of the fetus, say the first six or eight weeks of intrauterine life, and few are alleged to occur at this period. In fact, the woman may not know herself to be pregnant. We understand that if anything serious befalls the embryo or young fetus, it is much more likely to die outright and cause abortion than to sustain a radical arrest of development and live. Abortion itself is included

among the common expressions of degeneracy. The tendency to-day is to explain most fatal anomalies, even those of apparent arrested development, by amniotic adhesions. The latter are not very well understood, but it seems just for the present to class them also with evidences of degeneracy. The fact that the cortex develops very late in intrauterine life and only in an imperfect degree would naturally suggest the possibility of accidents late in gestations. But not only is there commonly no history or evidence of such, but the inability to develop could be traced to an inherent insufficiency of the germ plasm. It is only recently that we have comprehended the great rôle of the ductless glands on growth and development. It is, of course, possible that errors in this field are dependent immediately on anomalous development of the thyroid, thymus, pancreas, hypophysis, etc.

A special type of maternal influence is seen when the mother has a severe toxemia or cachexia. One with typhoid or advanced tuberculosis will give birth to a small, puny, sickly child, possibly short-lived. But it is very doubtful if these children can be regarded as degenerates, or that they have any special predisposition to epilepsy or idiocy. The germ plasm is not affected or, as Forel would say, the children are not necessarily blastophthoric. It is claimed that women in advanced tuberculosis sometimes bear large, healthy, well-nourished children, but this could hardly occur with typhoid fever or any other acute febrile process. Much maternal invalidism seems to be without any influence on epilepsy in the child or on degeneracy in general.

Procreation when either parent is alcoholized, whether this is acute or chronic, affords a good example of transient blastophthoria in which the germ plasm is temporarily damaged. The condition is the very antithesis of degenerative blastophthoria, yet the result might be the same in procreation.

This subject may be followed up case by case, or by the statistical method of Bezzola, who found, among a presumably healthy people, that there were documents that more tainted subjects were procreated during periods of celebration and merrymaking than at the opposite periods. Bezzola worked out his method for idiocy only, and Klöpfel for microcephalus. More recently Müller applied it to epilepsy, and found that many more epileptics than idiots appear to answer this requirement. In the author's material it is expressly stated that alcoholism in the ascendants was four times as common as epilepsy. This is very different from the material of some countries. In England, presumably not a sober country, only 8 per cent of epileptics had alcoholic ancestors. In Switzerland (some places) epileptics and idiots are called Rauschkinder (jag children).

Blastophthoria appears to be a purely hypothetical entity. When a generation is skipped, as when a normal mother, daughter of an

alcoholic, gives birth to a degenerate, we have to assume that blighted germ plasm can pass through a sound parent. If this is true, we can never be certain that a degenerate inherits directly from a degenerate parent, for both may be covictims and may have received the same blighted germ plasm from some one higher up. When the blastophthoric doctrine is contrasted with the "spontaneous" theory of degeneracy the latter seems to show up much stronger. From the Mendelian viewpoint the appearance of degenerates in a sound stock would resemble the appearance of new species. When sound and tainted individuals intermarry the progeny should comprise both sound and tainted individuals. If the germ plasm or fountain source is tainted, how can there be any sound individuals? In the 1,200 Jukes there was a very large per cent of healthy, normal subjects, good citizens. Eugenists would thus cut off good and bad alike and hence nominally should believe in blastophthoria.

The statement is sometimes made—dogmatically, as far as I know, but doubtless founded on statistics—that blood slightly tainted purifies itself in succeeding generations. Hence if a person in any way inferior marries into a sound stock the taint, if it is present at all in the progeny, soon disappears. In such a sound stock natural degeneracy would be remote. But if the stock were about to degenerate intermarriage with the tainted would precipitate it. This point would have to be taken into account in breeding. There should be tests for sound stock far removed from degeneracy—normal fertility, ability to suckle, normal vigor, freedom from abortions, menstrual irregularities, etc.—and a host of other requirements. If a man with a slight ancestral taint should marry it should be in such primitive stock. Degeneracy can hardly supervene all at once in a family. One generation ought to show a slight inferiority over its predecessor, such as could be readily demonstrated by applying standards. In human breeding approaching deterioration has always been recognized and attempts made to neutralize it by outside alliances.

It has been stated that 10 per cent of idiopathic epileptics undergo no mental deterioration from first to last. These must therefore differ radically from the 90 per cent who undergo mental failure. The latter test is used to differentiate epilepsy from hysteria, which of itself seems to indicate that such "benign" epilepsy must not be identical with the malignant form. Recoveries from epilepsy should belong to the benign type, but this need not follow, for cures could be effected, perhaps, before deterioration sets in. No special data in regard to causation and prophylaxis have been found for benign epilepsy. Gruhle terms this form of epilepsy "degenerative," the reason being obscure. He must mean that it is prima facie evidence of simple degeneracy.

According to Alzheimer, it is in epilepsy in those of sound stock that we are most likely to find constant lesions—sclerosis of the cornu of Ammon and marginal gliosis. This naturally suggests a special type of disease—a constant effect produced by the action of a single cause on a locality of least resistance. The single cause would have to be a bacterium or a toxin, with the chances much in favor of the latter. The toxin would be endogenous, of course, and could be explained by intestinal auto-intoxication, errors of metabolism, or disorders of the ductless glands. But if such a toxin could cause cortical lesions in the healthy, it should do so all the more readily in neuropathic subjects, syphilitics, the tuberculous, etc. These factors may therefore end by becoming mere accessories. The histological finds of Alzheimer are naturally not reckoned with the macroscopic lesions. Alzheimer says nearly all epileptics have a histological basis, while, as already stated, only one-third show macroscopic changes.

Therefore from this viewpoint we are justified in attempts to prevent the auto-intoxications. A survey of modern literature shows the predominance of the autotoxic theory in some form, even though one wishes to discount the significance of so-called auto-intoxication in an attempt to avoid a form of modern scientific cant; the material is very suggestive in metabolism study. Alexander, in England, believes firmly in the pernicious character of colonic putrefaction. Various resources for keeping the colon irrigated have had prompt and sustained good results in my hands. Lane, of England, performs ileosigmoidostomy; La Place, of France, and Alvès, of Peru, have performed appendicostomy and retrograde flushing. Doumer, of France, was so much impressed by results obtained in epilepsy in treating constipation with electricity that he reported the cases before the Academy of Sciences (Paris). Ebstein, in Germany, in a learned paper traced an intimate connection throughout the ages between gastro-intestinal disturbances and convulsive affections as a class. Epilepsy is no exception to this law, whatever its nature. Axtell, an American surgeon, has found over 30 cases of acute angulation and flexion of the sigmoid in epileptics causing mechanical obstruction. This all goes to suggest that in all possible candidates for epilepsy it is not enough simply to diet and evacuate the bowels. The whole colon should be examined, using all known resources. Many specialists recognize only mechanical causes of constipation. Let us suppose that in certain individuals certain substances are formed in the colon—powerful bodies like neurin and cholin. Like certain drugs, they have a selective affinity for particular cells. They are exquisitely neurotropic, like wood alcohol for the optic nerve, or the endotoxins of syphilis for the cortex and posterior cord. There are two ways of attacking this problem. First by diet—the future will soon see successful attempts to feed invalids exactly the nitrogenous com-

pounds they require. Inert and toxic combinations will be left out. Second, less by "regulating the bowels" than by discovery and removal of mechanical obstacles. Possibly the ideas of driving putrefactive bacteria out of the intestine by introducing hostile germs may be made to cooperate.

Most unbiased authorities agree that if syphilis, tuberculosis, and alcohol cause epilepsy it is impossible to determine to what extent they operate and how they effect this result. But, in any case, abundant influences are at work to antagonize each one of these hostile agencies, so that nothing further can be done in behalf of epilepsy.

It is evident that prevention of epilepsy in the potential subject can not differ from the general hygiene of confirmed epilepsy. Among the "candidates for epilepsy" the "one-attack" subjects must be included, for they have not yet been proved to be epileptics. Other candidates must be judged by their inheritance in part, but Vogt finds that the majority of those who ought to be epileptics never become so—a strange inheritance irony. Despite their ancestry, they may be quite normal, or at most only a little nervous. It therefore would be a hardship to submit all these children to strict discipline. In crossed heredity the latter might be justifiable. As a rule, though, it would be best to wait for evidences of the epileptic character. It is an open question whether children with the spasmophilic constitution should be regarded as potentials. According to Birk, they represent two very different types. If there is a doubt, the child should be given the benefit of it. (See Vogt and Scholz.)

The epileptic character should be familiar to nurses, governesses, teachers, school physicians, etc. It is described at length by many writers upon this subject. One needs, however, to sharply distinguish between these characteristics, which belong to the preconvulsive make-up, and those really a part of the disease, or a sequelæ of the deterioration inseparable from the well-established convulsive disorder. When it has been decided that a child has the epileptic character, or rather characters—for there are different types—he is placed under a regimen (which must tend to a certain extent to irritate him). He should be disciplined, dieted, kept from exciting scenes (like moving pictures), for attacks, which would be certain to appear, may be precipitated or intensified by effects which in themselves may act as excitants.

From the foregoing remarks, one is made aware that the prevention of epilepsy is closely bound up with (1) a more precise and intensive study of family stock from which the disease is recruited, (2) birth injuries and accidents must be still further eliminated, (3) the rearing of neuropathic individuals must be given more definite and painstaking attention, and (4) proper metabolism in potentially epileptic individuals must be still more energetically safeguarded.

DISCUSSION.

ELEANORA S. EVERHARD, M. D., Dayton, Ohio: In the noteworthy exhibit on mental hygiene I find the statement that healthy adjustment to environment depends upon, first, structural integrity of the nervous system; and, second, organization of sound habits. I have heard a great deal of discussion in regard to the first point; that is, upon insanity—feeble-mindedness—and the study of eugenics as a preventive measure, but I have heard very little discussion on the second point, namely, the organization of sound nerve habits.

In the same exhibit statistics given would seem to show that 250 insane per hundred thousand population is a high percentage. If it were possible to get statistics showing the number of individuals suffering from the popularly so-called functional neuroses, I suspect that we would find 250 per hundred thousand extremely low.

Realizing that the education of the individual begins in the cradle, and that the second step in education takes place in the public schools. it would seem that some provision for training in the organization of sound nerve habits should be found in the public schools.

We hear of school-teaching as a nerve-wrecking occupation, yet, when we consider the conditions under which the school-teacher labors, we find nothing in those conditions which need render teaching nerve wrecking, nor do I believe that it is so if the teacher understands anything whatever about the organization of sound nerve habits.

At the present time I have not sufficient data upon which to base a general statement which is scientifically accurate, but I have enough to assure me that those cases in my own practice who have been trained in nerve habits have ceased to find teaching nerve wrecking, and that they have borne in mind the organization of sound habits in the children under their charge.

If there were courses in mental hygiene in the normal schools, in which teachers might be taught in a practical way what is meant by sound habits and how they are to be organized, I believe that much would be done to prevent nerve instability and neuroses.

MAUDE E. MINER, secretary, New York Probation Association, New York City: Great effort should be made to secure mental examinations in our courts for the purpose of sifting out those who are mentally deficient and properly segregating them. Through dealing with girls in courts in New York City, where we find many who are mentally deficient, or by observing the work of Dr. Healy in the psychopathic clinic in Chicago, we see the necessity of such mental examinations.

I have found that many of the young girls who have entered prostitution, and for that reason come in conflict with the law, were not normal mentally, and were either feeble-minded, constitutionally

inferior, or so-called border-line cases. In one case we discovered that a mentally deficient girl in prostitution had a feeble-minded mother who had given birth to 13 illegitimate children. That mother should have been cared for by the State in a custodial institution, and so prevented from procreating her kind. It would be a great financial saving to the State, as well as a more humane thing, to provide for such women rather than care for their offspring in courts and prisons.

We find that the mental examinations help in dealing with those who are not of the feeble-minded class, determining the training that they need, helping us to discover the occupation for which they are best fitted, or in deciding whether or not commitment to an institution is desirable. By closely studying the individual, providing suitable mental examination, and then by adequately segregating those in need of it, we shall take a real step forward in the prevention of feeble-mindedness, of prostitution, and of crime.

Maximilian P. E. Groszmann, Ph. D., Plainfield, N. J.: I approve of Dr. Clark's conservative statement in regard to the effect of alcoholism in the parents upon the production of imbecile children. It is significant that Dr. Rogers, who is at the head of a large State institution for the feeble-minded, also emphasized that we should be very cautious in assuming that alcoholism can be considered as a hereditary cause of mental deficiency in the offspring. I am inclined to agree fully with him that alcoholism should be considered rather as a symptom of a deeper constitutional defect. It is one of the evidences of degeneracy. This inherent weakness will produce inebriety in one generation or individual of a tainted family, while it may produce other mental or moral defects in other individuals, or lead to criminality, prostitution, pauperism, and general inefficiency in still others. It would appear, therefore, to be one of the forms in which a degenerate type manifests itself. In other words, it is, in all probability, not a cause but an effect. At any rate the last word on the problem of alcoholic heredity has not yet been spoken.

But, certainly, if it were true that inebriety in the ancestors is a hereditary cause of mental defect, all of us assembled here should by rights be in an institution for the feeble-minded. For the ancestors of nearly all of us, half a dozen generations back, were heavy drinkers and rarely went to bed without a good-sized nightcap. In particular, the Germans should be mental and moral defectives, for it is a well-known custom for mothers in Germany to drink beer during pregnancy and lactation, sometimes upon the direct advice of the physician. More especially Munich should be a city of degeneracy owing to the sad hereditary effects which the "Münchner Hofbräu" must have upon the mental condition of the community, according to the alarmists who claim that parents who indulge in wine or beer

will have an imbecile offspring. And Munich has its American parallels in Milwaukee, Rochester, and Cincinnati, among others, where we ought to be prepared to find degenerate citizenship. As a matter of fact, however, the Germans are a virile nation of thinkers, artists, progressive merchants, and technical inventors of the first rank. Munich, in particular, is a city of academies, museums, and art galleries; and Milwaukee, Rochester, and Cincinnati are among the most progressive cities in the United States. If I am not mistaken, the President of this country is a citizen of Cincinnati.

Dr. J. E. Wallace Wallin, University of Pittsburgh: After having used the Binet-Simon graded tests of intelligence for several years on feeble-minded, epileptic, insane, and mentally retarded cases, I am convinced, not only that they are the best contribution for their purpose made in the field of child study during the last 25 years, but also that they are not nearly so accurate as some workers would have us believe. They are by no means infallible, popular magazine and newspaper exploiters to the contrary. For the adequate and reliable differentiation of the difficult or border cases—and there are many of these—the Binet scale must be supplemented by various clinical observations and various other psychological tests of those traits which are basic to intelligence. There is genuine danger in permitting the impression to get abroad unchallenged that we now have a perfect scale of intelligence, which will enable anyone, skilled or unskilled, to dissect the mental and moral mechanisms of any deviating child, and that no further investigating work is necessary. On the contrary, there is urgent need for the prosecution of a systematic program of research, in order to secure reliable mental age norms for all the important mental functions for our American children. Moverover, it can not be too strongly emphasized that mental diagnosis is even more difficult than physical diagnosis, and that no one, whether father, grade teacher, introspective psychologist, or physician, is qualified for this service unless he or she is thoroughly grounded in the modern methods of mental testing and clinical psychology. It is absurd to think that anyone can learn to identify the mental deviations of children simply by learning how to administer certain mechanical tests of intelligence. Mental deviations affect not only the intellectual but also the motor and emotional life. Properly to diagnose these cases requires not only the administration of tests of intelligence and volition, but the use of clinical methods which can only be acquired through years of first-hand experience and which can not be reduced to a rule of thumb. Amateur testers of mentally deviate children in the schools will probably do more harm than good. The problem is not merely the estimation of the degree of backwardness—the determination of the mental age of the child—but the discovery of the mental lapses, deviations, defects, or

excesses peculiar to each child, and the prescription of the differential, pedagogical, and medical treatment which the given case requires. Because a 17-year-old boy and a 12-year-old boy are 9 years old mentally is no reason why both should be subjected to the same educational régime. And that is just what we are doing to-day in the schools for subnormals.

Dr. Seelig, Berlin, Germany: Da Vortragender in seinen wertvollen Ausführungen auf Deutschland hingewiesen hat, sei mir gestattet, einige Errungenschaften der letzten Zeiten daselbst zu erwähnen. Zunächst ist es seit langem fürjeden Mediziner der seine Approbation erlangen will, erforderlich, dass er den erfolgreichen Besuch einer psychiatrischen Klinik nachweisen kann. Besonders aber werden die beamteten Aerzte immer wieder mit den neuesten Erfahrungen der psychiatrischen Wissenschaft bekannt gemacht.

Ausser den Medizinern sind es hauptsächlich die Juristen, für die derartige Kenntnisse von grösster Wichtigkeit sind. Zu diesem Zwecke haben sich an verschiedenen Stellen des Reiches forensisch-psychiatrische Gesellschaften gebildet, in denen Grenzfragen der beiden Disciplinen erörtert werden.

Auch in Deutschland ist die Frage nach den psychischen Defecten bei der verwahrlosten und criminellen Jugend eine ausserordentlich wichtige und acute. Gerade die Fürsorge für diese und ihr Studium durch Psychiater geben die Möglichkeit einer Vorbeugung von Geisteskrankheiten und Verbrechen.

Was die Aufklärung des grossen Publikums über die Fragen der Geisteskrankheiten betrifft, so gehört auch dazu, dass sensationelle Nachrichten aus diesem Gebiete, die für den Fachmann häufig genug den Stempel der Erfindung oder Uebertreibung tragen, nicht durch Weiterverbreitung einen schädigenden und alarmierenden Einfluss auf die Massen ausüben. In allerletzten Zeit hat sich bei uns deshalb ein Comittee gebildet, das aus Psychiatern und Mitgliedern der Presse besteht, um zu versuchen, wenn derartige sensationelle Gerüchte auf dem Gebiete des Irrenwesens enstehen, diese auf ihre Wahrheit zu prüfen oder auf das richtige Mass zurückzuführen.

Ich habe diese Punkte erörtert, um zu zeigen, dass manche der vom Vortragenden erwähnten Probleme bei allen Culturvölkern bestehen und nicht nur vom nationalen sondern internationalem Interesse sind.

○

TRANSACTIONS

OF THE

Fifteenth International Congress on Hygiene and Demography

WASHINGTON

September 23–28, 1912

PUBLISHED BY THE COMMITTEE ON ORGANIZATION

EDITED BY THE SECRETARY GENERAL

VOLUME III

PART II.—PROCEEDINGS OF SECTION IV

Hygiene of Occupations

WASHINGTON
GOVERNMENT PRINTING OFFICE
1913

OFFICERS OF SECTION IV.

PRESIDENT.

Dr. George M. Kober, Professor of Hygiene, Georgetown University, Washington, D. C.

HONORARY PRESIDENTS.

Sir Thomas Oliver, London, England.
Prof. Dr. L. von Frankl-Hochwart, Vienna, Austria.
Sir Arthur Whitelegge, London, England.
Dr. Ludwig Teleky, Vienna, Austria.
Prof. L. Carozzi, Milan, Italy.
M. Henri Mamy, Paris, France.
Miss Margaret McMillan, London, England.
Prof. Dr. Wilhelm Lindemann, Bochum, Germany.
Prof. Dr. Theodor Weyl, Berlin, Germany.
Prof. Tadahiro Noda, Tokyo, Japan.

VICE PRESIDENTS.

Miss Josephine Goldmark, New York City.
Dr. Wm. C. Hanson, Boston, Mass.
Dr. Frederick L. Hoffman, Newark, N. J.

SECRETARY.

Dr. Alice Hamilton, Chicago, Ill.

CONTENTS.

	Page.
Report of the Secretary	491
Address by the President	499
The Effects of Temperature and Humidity on Fatigue. Prof. Frederic S. Lee.	504
Fatigue Factors in Certain Types of Occupations. Shepherd Ivory Franz.	512
The Study of Fatigue and its Application to Industrial Workers. Josephine Goldmark.	517
Some Considerations Regarding the Factor of Fatigue with Reference to Industrial Conditions. Prof. William A. White.	526
The Suppression of Unnecessary Noise. Dr. Clarence John Blake.	533
Existing Legal Provisions with Regard to the Suppression of Unnecessary Noises. Stoughton Bell.	536
Stimmhygiene, ihre Bedeutung und ihre Organisation in Preussen (Deutschland) Prof. Dr. Th. S. Flatau.	541
Die Beschäftigungsneurosen. Prof. Dr. L. v. Frankl-Hochwart.	543
What Occupation Neuroses Really Are. Dr. Tom A. Williams.	566
An Unusual Form of Mineral Poisoning Affecting the Nervous System. Manganese? Dr. Louis Casamajor.	574
Eyestrain and Occupational Disease. Dr. George M. Gould.	582
A New Therapeutic Agent in Ophthalmology. Dr. C. G. Precerutti.	605
An Unsuspected Cause of Caisson Disease. T. Kennard Thomson.	608
Die Gefahren der Caissonarbeit. Dr. Philipp Silberstern.	610
The Acute Effects of Caisson Disease. Dr. Seward Erdman.	619

Page.

The Late Manifestations of Compressed-Air Disease 626
Dr. Peter Bassoe.

Caisson Disease and its Prevention 639
Henry Japp.

The Effects of Exposure to Intense Heat on the Working Organism 655
Surg. Charles N. Fiske.

Uber die Unglücksfälle und Berufskrankheiten der Minen- und Tunnelarbeiter 673
Dr. Wilhelm Lindemann.

Diseases and Accidents of Miners and Tunnel Workers in the United States... 691
Dr. Joseph A. Holmes.

Injuries Caused by Electricity 703
Sir Thomas Oliver.

Injuries and Diseases Occurring in Electric Generating Plants 710
Dr. J. D. McGowan.

Die Unfälle und Erkrankungen der Eisenarbeiter 712
Prof. Dr. Friederich Röpke.

Accidents par électrocution 730
Paul Weiss.

The Incidence of Industrial Anthrax in Liverpool 735
Dr. E. W. Hope.

The Economic Aspects of Hookworm Disease in Porto Rico 742
Dr. Bailey K. Ashford.

The Economic Aspects of Hookworm in the United States 757
Prof. C. W. Stiles.

Occupational Brass Poisoning: Brass Founder's Ague 764
Dr. Emery R. Hayhurst.

Industrial Mercurial Poisoning in Felt-Hat Makers 778
Dr. Frank E. Tylecote.

Die Gefahren in dem Gebrauche des Quecksilbers in der Industrie 788
Dr. Karl Heucke.

L'hydrargysme dans les couperies de poils 800
Dr. D. J. Glibert.

Lead Poisoning in the United States 809
Dr. Alice Hamilton.

Industrial Lead Poisoning and some of the Problems it Raises 821
Sir Thomas Oliver.

Industrial Plumbism 827
Dr. Francis D. Patterson.

Occupational Diseases in New York 829
Dr. W. Gilman Thompson.

Page.

Legal Protection for Workers in Dangerous Trades in the United States..... 836
John B. Andrews.

Occupational Diseases and the Physical Examination of Workers..... 844
Dr. George M. Price.

Examination of Employees for Tuberculosis..... 849
Dr. Theodore B. Sachs.

Results of a Hygienic and Sanitary Inquiry into the Italian Printing Trade... 857
Prof. Dr. L. Carozzi.

Hygienic and Sanitary Inquiry in Silk Mills..... 859
Prof. Dr. L. Carozzi.

The American Museum of Safety..... 860
William H. Tolman.

Die ständige Ausstellung für Arbeiterwohlfahrt in Charlottenburg (Anstalt des Deutschen Reichs)..... 870
Dr. Ing. Konrad Hartmann.

Sanitary Control of an Industry by the Industry Itself..... 881
Lillian D. Wald.

Industrial Insurance the Basis of Industrial Hygiene..... 890
Lee K. Frankel.

The Hygiene of Occupation and its Administrative Control..... 899
Dr. William C. Hanson.

The Prevention of Occupational Diseases..... 900
Dr. H. Linenthal.

Ueber japanisches Fabrikgesetz..... 907
Dr. Tadahiro Noda.

The Relation of the United States Bureau of Labor to Industrial Hygiene..... 914
Charles H. Verrill.

State Commissions on Occupational Diseases..... 920
Prof. Charles R. Henderson.

Government Study of Occupational Diseases..... 928
Prof. John R. Commons.

Effects of Industrial Strain on the Working Woman..... 933
Dr. Rosalie Slaughter Morton.

Infant Mortality in Relation to Factory Labor..... 943
Dr. George Reid.

Infant Mortality in Relation to Factory Labor..... 947
Dr. John Robertson.

Altersprobleme gewerblicher Hygiene..... 957
Dr. Ludwig Teleky.

The Labor and Work of Children Should be Adapted to the Individual Child.. 975
Dr. Thomas Morgan Rotch.

Page.

The Effects of Monotonous Toil in the Years Preceding Adolescence..... 985
MARGARET MCMILLAN.

Child Labor in the United States..... 1001
OWEN R. LOVEJOY.

The Causes, Evils, and Remedy for Tenement-House Manufacturing..... 1011
Dr. A. S. DANIELS.

How and Why Smoke is Injurious..... 1015
Prof. RAYMOND C. BENNER.

A Study of the Influence of Varying Densities of City Smoke on the Mortality from Pneumonia and Tuberculosis..... 1020
Prof. WILLIAM CHARLES WHITE and C. H. MARCY.

A Psychosis following Carbon-Monoxide Poisoning, with Complete Recovery.. 1027
Dr. MARY O'MALLEY.

Index..... 1039

The proceedings of the Joint Session of Sections IV and IX are found in Volume I, Part II.

SECTION IV.

HYGIENE OF OCCUPATIONS.

REPORT OF THE SECRETARY.

Dr. GEORGE M. KOBER, *President Section IV,*
Fifteenth International Congress on Hygiene and Demography.

SIR: In accordance with the provisions of Article XII of the regulations of the congress, I herewith submit a report of the proceedings of Section IV during the meeting held at Washington, September 23 to 28, 1912, together with such manuscripts of the papers read as have been delivered into my hands.

MONDAY, SEPTEMBER 23, 1912—4.15 P. M.

The first session was called to order by the president, Dr. George M. Kober, who announced the following honorary presidents of Section IV:

Sir THOMAS OLIVER (England), Prof. Dr. L. VON FRANKL-HOCHWART (Austria), Sir ARTHUR WHITELEGGE (England), Dr. L. TELEKY (Austria), Dr. L. CAROZZI (Italy), M. HENRI MAMY (France), Miss MARGARET MCMILLAN (England), Prof. Dr. WILHELM LINDEMANN (Germany), Prof. Dr. THEODOR WEYL (Germany), Prof. TADAHIRO NODA (Japan).

An introductory address on The Hygiene of Occupation was given by the president.

Papers were presented in the symposium on the physiology and pathology of work and fatigue as follows:

The Effects of Temperature and Humidity on Fatigue, by Prof. Frederic S. Lee, Columbia University, College of Physicians and Surgeons, New York City.

Fatigue Factors in Certain Occupations, by Prof. Shepherd I. Franz, George Washington University, Washington, D. C.

The Study of Fatigue and its Application to Industrial Workers, by Miss Josephine Goldmark, National Consumers' League, New York City.

The Fatigue Neuroses, by Prof. Wm. A. White, George Washington University, Washington, D. C.

Deleterious Effect of Unnecessary Noise, by Dr. Clarence John Blake, professor of otology, Harvard Medical School, Boston.

Existing Legal Provisions with Regard to the Suppression of Unnecessary Noises, by Mr. Stoughton Bell, Boston, Mass.

The subject of unnecessary noises was discussed by Prof. James J. Putnam, of Harvard University.

Stimmhygiene, Ihre Bedeutung und Ihre Organisation in Preussen (Deutschland), von Prof. Dr. Th. S. Flatau, Leiter der phonetischen Abteilung bei der Kgl. Universitäts Ohren- und Nasenklinik, Berlin, Germany.

TUESDAY, SEPTEMBER 24, 1912—9.15 A. M.

President Kober presided during the morning session.

In the symposium on occupation neuroses the following papers were presented:

Die Beschäftigungsneurosen, by Prof. Dr. L. v. Frankl-Hochwart, Vienna, Austria.

What Occupation Neuroses Really Are, by Dr. Tom A. Williams, Washington, D. C.

An Unusual Form of Mineral Poisoning (Manganese?) Affecting the Nervous System, by Dr. Louis Casamajor, New York City.

Eye Strain and Occupational Disease, by Dr. George M. Gould, Atlantic City.

A New Therapeutic Agent in Ophthalmology, by Dr. C. G. Precerutti, head physician of the ophthalmological section of the Cottolengo Hospital and head consulting physician at the Ophthalmic Hospital of St. Joachim, of Turin.

A symposium on the physiology and pathology of work in compressed air followed:

An unsuspected Cause of Caisson Disease, by T. Kennard Thomson, vice president, American Society of Mechanical Engineers, New York City.

Die Gefahren der Caissonarbeit, von Dr. Philipp Silberstern k. k. Polizei-Ober-Bezirksarzt, Wien.

The Acute Effects of Caisson Disease, by Dr. Seward Erdman, instructor in clinical surgery, Cornell University, Medical College, New York City.

The Remote Effects of Caisson Disease, by Dr. Peter Bassoe, Rush Medical College, Chicago.

The Prevention of Caisson Disease, by Henry Japp, member Am. Soc. C. E., New York City.

The following members of the congress joined in the discussion: Sir Thomas Oliver, England; Dr. Andrew Harvey, Chicago; Dr. L. de Pulligny, Paris; Henry Copley Greene, Boston; Dr. Charles H. Crankshaw, Newark; Dr. Julius Grinker, Chicago.

TUESDAY, SEPTEMBER 24, 1912—2 P. M.

President Kober and Honorary President von Frankl-Hochwart presided.

A paper on the Exposure of the Organism to Intense Heat was presented by Surg. Charles N. Fiske, United States Navy, Washington, D. C.

In the symposium on diseases and accidents caused by electricity the following papers were presented:

Injuries Caused by Electricity, by Sir Thomas Oliver, Newcastle upon Tyne, England.

Diseases and Injuries Occurring in Electric Generating Plants, by Dr. J. D. McGowan, Chicago, Ill.

Die Unfälle und Erkrankungen der Eisenarbeiter, von Prof. Dr. Röpke, Solingen.

Accidents par Électrocution, by M. Paul Weiss, chief mining engineer of Paris, Ministry of Public Works, Paris, France.

In the symposium on diseases and accidents of miners and tunnel workers the following papers were read:

Ueber die Unglücksfälle und Berufskrankheiten der Minen- und Tunnelarbeiter, von Dr. Wilhelm Lindemann, Bochum, Germany.

Diseases and Accidents of Miners and Tunnel Workers in the United States, by Dr. Joseph A. Holmes, Director, United States Bureau of Mines, Washington, D. C.

These papers were discussed by Dr. R. M. Cunningham, Alabama.

WEDNESDAY, SEPTEMBER 25, 1912—9.15 A. M.

President Kober, Honorary President Sir Thomas Oliver, and Vice President Frederick L. Hoffman presided at the morning meeting.

Papers were presented in the symposium on occupational diseases as follows:

The Incidence of Industrial Anthrax in Liverpool, by Dr. E. W. Hope, medical officer of health, city and port of Liverpool, and professor of hygiene, Liverpool University; and Dr. W. Hanna, assistant medical officer.

The Economic Aspects of Hookworm Disease in Porto Rico, by Dr. Bailey K. Ashford, United States Army, San Juan, P. R.

The Economic Aspects of Hookworm Disease in the United States, by Prof. C. W. Stiles, United States Public Health Service, Washington, D. C.

Occupational Brass Poisoning—Brass Founder's Ague, Dr. Emery R. Hayhurst, College of Medicine of the University of Illinois, Chicago.

Industrial Mercurial Poisoning in Felt-Hat Makers, by Frank E. Tylecote, M. D., D. P. H., M. R. C. P., honorary physician to the Salford Royal Hospital, Manchester, England, visiting physician to the South Manchester Union hospitals.

Die Gefahren in dem Gebrauche des Quecksilbers in der Industrie, von Dr. Karl Heucke. Königl. Gewerberat, Wesel, Rhein.

L'Hydrargyrisme dans les Couperies de Poils, par le Dr. D. J. Glibert, Inspecteur Général du Travail à Bruxelles.

Industrial Plumbism, Dr. Alice Hamilton, Hull House, Chicago; Sir Thomas Oliver, Newcastle upon Tyne, England; Dr. Francis D. Patterson, Philadelphia.

Occupational Diseases in New York, by W. Gilman Thompson, M. D., New York City.

Legal Protection for Workers in Dangerous Trades in the United States, John B. Andrews, secretary. American Association for Labor Legislation, New York City.

The following members of the congress joined in the discussion:

Dr. Wickliffe Rose, Washington, D. C.; Dr. Claude A. Smith, Atlanta; Dr. Bailey K. Ashford, United States Army, San Juan. P. R.; Mr. Edgar T. Davies, Chicago.

THURSDAY, SEPTEMBER 26, 1912—9.15 A. M.

President Kober and Honorary President Sir Thomas Oliver presided.

Papers were presented in the symposium on the medical examination of employees as follows:

Occupational Diseases and Physical Examination of Workers, by Dr. George M. Price, director of investigation, New York State Factory Investigating Commission, New York City.

Examination of Employees for Tuberculosis, by Dr. Theodore B. Sachs, Chicago.

The Results of a Hygienic and Sanitary Inquiry into the Italian Printing Trade; A Hygienic and Sanitary Inquiry in Silk Mills, by Prof. L. Carozzi, Milan, Italy.

The American Museum of Safety, its Organization, Objects, and the Three Departments of Accident Prevention, Industrial Hygiene, and Mutuality, by Wm. H. Tolman, director American Museum of Safety, New York City.

Die ständige Ausstellung für Arbeiterwohlfahrt in Charlottenburg. (Anstalt des Deutschen Reichs.) Von dem technischen Leiter der Ausstellung, Dr. Konrad Hartmann, Berlin-Grunewald.

In the symposium on the protection and welfare of workers papers were read as follows:

The Sanitary Control of an Industry by the Industry Itself, by Miss Lillian Wald, head resident nurse, Henry Street Settlement, New York City.

Industrial Insurance, the Basis of Industrial Hygiene, by Dr. Lee K. Frankel, Metropolitan Life Insurance Co., New York City.

The following members of the congress joined in the discussion of these papers:

Miss Margaret McMillan, London; Dr. Ernest D. Easton, Newark; Dr. George M. Price, New York City; Dr. Charles W. Crankshaw, Newark; Dr. I. M. Rubinow, Washington, D. C.

THURSDAY, SEPTEMBER 26, 1912—2 P. M.

President Kober and Vice President Dr. Wm. C. Hanson of Boston presided.

Papers were presented in the symposium on governmental study of occupational hygiene as follows:

The Hygiene of Occupation and its Administrative Control, by Dr. Wm. C. Hanson, assistant to the secretary, Massachusetts State Board of Health, Boston.

The Prevention of Occupational Diseases in Massachusetts, by Dr. H. Linenthal, State inspector of health, Boston, Mass.

Prevention of Occupational Diseases in Japan, by Medizinalrat Dr. med. Tadahiro Noda, Tokyo.

The Relation of the United States Bureau of Labor to Industrial Hygiene, by Charles H. Verrill, of the United States Bureau of Labor.

State Commissions on Occupational Diseases, by Prof. Charles R. Henderson, University of Chicago.

State Commissions on Occupational Diseases, by Prof. John R. Commons, University of Wisconsin, Madison.

In the symposium on sex problems in industrial hygiene papers were read as follows:

Effects of Industrial Strain upon the Health of Working Women, by Dr. Rosalie Slaughter Morton, New York City.

Infant Mortality in Relation to Factory Labor, by Dr. George Reid, medical officer of health, Staffordshire, England, and Dr. John Robertson, medical officer, Birmingham, England.

In the symposium on age problems in industrial hygiene the following papers were read:

Altersprobleme gewerblicher Hygiene, von Dr. Ludwig Teleky, Wien, Austria.

The Labor and Work of Children Should be Adapted to the Individual Child, by Thomas Morgan Rotch, M. D., Boston.

These papers were discussed by Edward T. Davies, Springfield.

It was moved and seconded that the resolutions introduced by Sir Thomas Oliver and Dr. William C. Hanson be approved and forwarded to the president of the Permanent International Commission, Dr. Max Rubner, with the request that they be approved by the commission.

The resolution proposed by Sir Thomas Oliver is as follows:

Resolved, That for the important object of securing the highest degree of practical utility in the notification, tabulation, and analysis of the official returns of occupational diseases it is recommended that such notification and returns should be made in a uniform manner by international agreement.

Resolved further, That such nations and States which do not as yet provide for a compulsory notification of occupational diseases are earnestly urged to do so at the earliest opportunity.

The resolution proposed by Dr. William C. Hanson is as follows:

Resolved, That all physiological and pathological studies of occupational diseases be conducted by persons who, in addition to a medical education, possess a practical knowledge of sanitary science with special reference to the hygiene of occupations.

Resolved further, That in the prevention of occupational diseases the subject of factory sanitation be supplemented by measures providing for general education in personal and occupational hygiene, and in the improvement of the housing conditions, food, and community life of the employees.

FRIDAY, SEPTEMBER 27, 1912—9.15 A. M.

President Kober and Honorary President Sir Thomas Oliver presided.

The following papers were read:

The Effects of Monotonous Toil in the Years Preceding Adolescence, by Miss Margaret McMillan, member of school board, London, England.

Child Labor in the United States, by Owen R. Lovejoy, New York City.

Tenement-house Manufacture, the Causes, Evils, and Remedy, by Dr. Annie Sturges Daniel, New York City.

The following papers on the problem of the smoke nuisance in industrial cities were presented:

How and Why Smoke is Injurious, by Prof. Raymond C. Benner, department of industrial research, University of Pittsburgh.

The Influences of Heavy Smoke on Acute and Chronic Lung Infections, by Dr. Wm. Charles White, associate professor of medicine, University of Pittsburgh.

A Psychosis following Carbon Monoxide Poisoning, with Complete Recovery, by Dr. Mary O'Malley, senior assistant physician, Government Hospital for the Insane, Washington, D. C.

FRIDAY, SEPTEMBER 27, 1912—2 P. M.

A joint session of Sections IV and IX. The session was called to order by Prof. Walter F. Willcox, the president of Section IX.

The following papers were presented:

Industrial Accidents and Trade Diseases in the United States, by Frederick L. Hoffman, LL. D., Statistician, Prudential Insurance Co., Newark, N. J.

Reporting of Industrial Accidents, by Prof. Robert E. Chaddock, Columbia University, New York City.

Demography of Industries and Occupations, by M. Lucien March, Director of the General Statistics of France, Paris.

Mortality from Alcohol in the United States, by Edward Bunnell Phelps, Editor, the American Underwriter, New York City.

Respectfully submitted.

ALICE HAMILTON, M. D.,
Secretary of Section IV.

MONDAY AFTERNOON, SEPTEMBER 23, 1912.

THE HYGIENE OF OCCUPATIONS.

Introductory address by GEORGE M. KOBER, M. D., LL. D., professor of hygiene, Georgetown University, Washington, D. C., president of Section IV.

Health is the chief asset of the workingman, and no greater calamity can befall him than when his earning capacity is impaired or arrested by reason of sickness or disability. It means, in many instances, the utter financial ruin of the family, and is doubtless one of the most potent causes of poverty and distress.

Many of the diseases are incident to occupation and environments, and industrial efficiency and earning power can be promoted by appropriate safeguard and adequate protection of the men, women, and children engaged in gainful occupations.

In the search for the causes and prevention of diseases, the interests of the wage earners have not been neglected; indeed, it may be truly said that a special department of social medicine has been created, with a most complete and satisfactory literature relating to the hygiene of occupations and the prevention of occupational diseases and accidents.

German authors in 1897 issued a volume of over 1,200 pages, and English authors, under the editorship of Sir Thomas Oliver, devoted 891 pages to "Dangerous trades, the historical, social, and legal aspects of industrial occupations as affecting health."

A pioneer study was made by Prof. Ramazzini, of Padua, as early as 1700, and his monograph was translated into English in 1705, and also into French, in 1777.

In 1810, the French Government issued a decree relating to "etablissements dangereaux, insalubres et incommodes" and, in 1815, the English Parliament appointed a commission to inquire into the condition of factories.

In 1822, Mr. C. Turner Thackrah, of Leeds, wrote a monograph on the "Effects of the arts, trades, and professions, and of civic states and habits of living, on health and longevity" and, in 1845, Halford, of Germany, published a very important work on occupational diseases.

In 1833 and 1865 the English Parliament again appointed commissioners, and, in 1839, the "Academie des Sciences Morales et Politi-

ques de France" and, subsequently, Bavaria, Prussia, and the German Empire directed similar investigations.

As a result of these efforts and of numerous independent investigations it is known to-day that persons habitually engaged in hard work, especially in factories and indoors, present a greater amount of sickness and a higher mortality than persons more favorably situated, and that the character of the occupation to a great extent influences, not only the average expectation of life, but also the prevalence of certain diseases.

It is known, for example, that bronchitis, pneumonia, and tuberculosis are much more frequent in dust-inhaling occupations, and that the sharp angular particles of iron and stone dust, and mixed animal and vegetable dust, are more liable to produce injury of the respiratory passages than coal, flour, grain, and some other forms of dust.

It is also known that workers in lead, mercury, phosphorus, poisonous dyes, and toxic or irritating fumes suffer especially from the injurious effects, and that other occupations, such as mining, railroading, and those which necessitate working with or around moving machinery, involve especial danger to life and limb.

For these reasons, workers in many industries need special protection, and in order to render this efficient, it must be provided for by the enactment and enforcement of suitable laws. In 1833, 1864, and 1870, England enacted the so-called factory laws. France provided a child-labor law in 1841, and, in 1874, a more satisfactory labor code. Germany and other continental governments enacted suitable legislation between 1859 and 1886.

According to Miss S. S. Whittelsey's "Essay on Massachusetts labor legislation" child labor received attention in that State as early as 1836. The first law as regards safety and sanitation was enacted in Massachusetts in 1877, since which time 42 States have enacted laws providing for the reporting of industrial accidents in factories, mines, and railroads.

Occupational diseases have been shamefully neglected, and it is only within the last two years, 1911 and 1912, that California, Connecticut, Illinois, Maryland, Michigan, New Jersey, New York, and Wisconsin have followed the lead of Massachusetts, and enacted laws requiring physicians to report occupational diseases, including anthrax, compressed air or caisson disease, and poisoning from lead, phosphorus, arsenic, and mercury, or their compounds.

Forty-eight States now have laws designed to provide for the installation of safety devices for the prevention of industrial accidents from moving machinery.

Dr. Andrews reports that regulations for protection against injurious dust have been enacted in 22 States, against defective or improper lighting in 12 States, against poisonous gases, fumes, and

vapors in 15 States, against excessive temperature and humidity in 11 States, for the protection of workers in compressed air in 1 State only (New York).

Thanks to the efforts of the National Association for Labor Legislation, Congress, after two years of investigation, by an act approved April 9, 1912, prohibits the manufacture of poisonous phosphorus matches in the United States after July 1, 1913.

Thirteen States have workmen's compensation or accident insurance laws, all of which were enacted during the last two years.

No provision, however, has yet been made in the United States for insurance against occupational diseases. Industrial diseases and accidents are everywhere assuming more and more importance, not only to wage earners, but to all who are interested in the conditions under which our fellow men and women live and work, and our knowledge should be based upon accurate data. In countries and States where reports of certain occupational diseases are compulsory it is quite possible to secure reliable data as to the number of cases of industrial poisoning. The same may be said of the facilities afforded by the statistics of the German industrial insurance institutes, which furnish not only the number of deaths, but also the number of cases treated, together with the age period and duration of the disease. Similar facts should be collected in this country. This is all the more important when it is remembered that, even with the most complete statistics, it is extremely difficult to determine all the factors which influence the health and longevity of operatives. Great differences are found in the conditions under which the work is performed, some of which are entirely avoidable, while others are not; and it is hardly fair to characterize certain trades as dangerous, when experience has shown that no harm results when proper safeguards have been taken.

In the consideration of this question the personal element of the workmen, their habits, mode of life, food, home environments, and so forth, can not be ignored. There are a number of occupations in which the alcohol habit prevails to an unusual extent, perhaps because of the character of the work, perhaps as a result of association, and it would not be fair to attribute the ill health of the operatives altogether to the character of the employment. Again, many persons are engaged in occupations for which they are not physically fitted, while others ruin their health by vice, dissipation, improper food, and insanitary environments. In addition to all this, there are factors, such as water and soil pollution, for which neither the industry nor the individual is primarily to blame. Thus, for example, the general anæmia and debility of the agricultural classes in Porto Rico was attributed some years ago to their occupation and starvation,

when, as a matter of fact, Ashford demonstrated that it was caused by the hookworm disease and spread by soil pollution. Similar investigations have shown that much of the ill health among the textile workers in the South is due to hookworm infection, and can be eradicated by the administration of thymol and the construction of sanitary privies to prevent soil pollution. All this indicates the need of a thorough study of the condition affecting health in various occupations, not only to determine the relative health risks and the causes of the undue prevalence of certain diseases in certain occupations, but also to formulate rules which may remove the causes or render the system better fitted to resist them. In this, as in all preventive efforts, a hearty cooperation of the parties interested is absolutely essential for the attainment of the highest measure of success. In this instance the responsibility rests with the State, the employer, and employee; each have certain duties to perform, and the help of all is necessary for the mitigation of existing evils.

We can not enter into details of the industrial diseases, except to say that among the occupations usually classed as inimical to health are bleachers, bookbinders, brass founders, compositors, coppersmiths, electrotypers, stonecutters, gas-work employees, white-lead workers, potters, match workers, mirror makers and workers in mercury, persons employed in the manufacture of explosives, firemen, file makers, rubber, factory, and textile operatives.

Sir Thomas Oliver, in his address on "Dust and fumes, foes of industrial life," will point out the human and economic aspect of the work in which we are engaged. It is certainly startling to be told by Mr. Fredk. L. Hoffman, in his monograph on "Mortality from consumption in dusty trades," that the general death rate for 1900 in manufacturing and mechanical industries of the United States was 13.8 per 1,000 and the consumption rate 2.6, or 18.8 per cent, of the mortality from all causes, while the farming population furnished a consumption rate of only 1.5, or 9.5 per cent, of the mortality from all causes. Indeed, it is estimated that nearly 70,000 wage earners perish every year from industrial tuberculosis, and that by factory inspection and effective methods for the prevention and removal of dust fully one-half of these lives could be saved.

This is not at all speculative, since Prof. Röpke informs us that, as a result of general education and factory sanitation, the mortality at Solingen, in Germany, the population of which is largely made up of employees in the cutlery industry, has been reduced from 20.63 per 1,000 in 1885 to 9.3 per 1,000 in 1910, and the consumption death rate from 540 in 1885 to 180 in 1910, per 100,000 of population. Similar data are available to show that diseases of the respiratory organs in one of the German cement works has been reduced from

9.3 per cent to 3.3 per cent after the installation of a suitable apparatus for the removal of dust.

What can be done in some of the most dangerous industries in Germany can be done in this country, and will be done as soon as the importance of the subject is fully appreciated.

Apart from the terrific waste of human life from occupational diseases consider, if you please, that there were, according to Prof. Star, 3,500 deaths in 1910 from industrial accidents in the United States. In addition to this there are an average of 3,000 killed and over 6,000 injured in the coal mines. "The total number of railroad casualties for the year ending June 30, 1911, was 160,555 (10,396 killed and 150,159 injured); of this number, 439 killed and 79,237 injured are classed under the head of "industrial accidents," which did not involve the movement of cars or engines on rails."[1]

What an excess of pain and sorrow, what an ocean of blood and tears, are contained in these figures. And alas, what an amount of ignorance and neglect when we compare our statistics with those of other countries and learn that the average number of men killed for each 1,000 men employed in coal mining in our own country, in 1909, was 4; in Prussia, 2.06; in Great Britain, 1.28; in Belgium, 1; and in France, 0.91. Is it not fair to assume that these figures clearly indicate that we have been derelict in efforts to safeguard the lives and limbs of our working classes? After almost fifteen years of agitation Congress finally created a Bureau of Mines a little over one year ago, and there is much reason for assuming that, under the humane and intelligent efforts of the chief and his accomplished staff, beneficent results may be expected.

Let us remember that over one-third of our population is engaged in industry and that we have just begun to realize what a tremendous and unnecessary toll death has been exacting in many of our industries. It is to be hoped that the deliberations of this section will serve to prevent this needless sacrifice of life and health. In the language of the New York Factory Investigating Commission:

> The State not only possesses the power and the right, but is it charged with the sacred duty of seeing that the worker is properly safeguarded in case of fire, that he is protected from accidents caused by neglect or indifference, that proper precautions are taken to prevent poisoning by the materials and processes of his industry, and that he works under conditions conducive to good health and not such as breed disease.

While I am a strong believer that the hygiene of occupations is largely a public-health function, and should be under the supervision of Federal and State health authorities, it is possible that the creation of departments of labor and health will result in a closer cooperation and coordination of the efforts for the conservation of human life and

happiness than any other method of administration heretofore proposed for the solution of this important problem.

[1] Accident Bulletin No. 40, Railroad accidents in U. S. Int. Com. Comm. 1911.

THE EFFECTS OF TEMPERATURE AND HUMIDITY ON FATIGUE.

FREDERIC S. LEE, Ph. D., Dalton professor of physiology, Columbia University, New York.

The physiologist in his fondness for investigating internal mechanisms is prone to overlook the important fact that the living body exists in the midst of a multitude of external conditions. These conditions furnish stimuli to the living tissues, augmenting or diminishing their actions, and such stimuli play an important part in determining the activities and correlations of the internal mechanisms. The organism as a whole in the midst of its environmental conditions must establish for itself at each successive moment a balance in the work of its various parts. If one of the conditions is altered this balance is by so much disturbed. Within limits, and even within wide limits for brief periods, such a disturbance is borne with impunity: a readjustment to the altered situation occurs; a new balance is struck; and no harm results. But if the limits be much or long surpassed the normal adaptation gives place to a pathological state which is detrimental to the organism.

Of the two environmental conditions here in question, the temperature and the humidity of the air, there exists a certain medium range of variation within which the human body is capable of performing its best work. Even when adapted to this optimum it may be subjected for a considerable period of time to a high temperature or a low temperature, to a high humidity or a low humidity, without serious disturbance of its organic balance. One need not be a man of science to realize this truth; one needs not to live outside of our own America, famed for its fitful climate. But prolonged exposure to extremes of these conditions does not conduce to the continuance of a normal physiological state. The effects of a low temperature and a low humidity have not been studied as fully as have those of the opposite extremes, and these two latter have especial significance when they are associated with one another. I propose therefore to confine myself to a discussion of the physiological and pathological relations of the living body when subjected simultaneously to high temperature and high humidity.

We may observe these relations on many of the hot and humid summer days in our American cities. We may observe them when one who is adapted to a temperate climate goes to live in the Tropics.

They are well illustrated in various industrial occupations, such as mining, baking, laundering, and some varieties of cotton weaving. The effects of exposure to the atmosphere of these situations are many and various. The bodily mechanism for resisting external heat is at once brought into action. The blood vessels of the skin become dilated and charged with blood, the skin becomes heated, and the sweat glands become active. From the skin there occurs a loss of bodily heat by radiation, conduction, convection, and the evaporation of perspiration. The loss of heat by these processes, amounting, according to Rubner,[1] to 95.25 per cent of the total heat loss, may suffice for a time to keep the bodily temperature at its normal level. In proportion, however, as the temperature of the air approaches or surpasses that of the body and the humidity of the air is sufficient to prevent the evaporation of sweat, loss of bodily heat by the customary channels becomes lessened. Without adequate means for eliminating the heat that is being constantly produced within, the internal temperature rises and a febrile condition results. Such a state is reached the sooner the more mechanical work is performed and the more heat is thereby produced. Its oncoming is favored also by a lack of movement in the air. With a continuance of the unfavorable environmental conditions a simple rise of internal temperature may pass into a higher fever characteristic of simple heat prostration, or a moderately severe heat stroke with a temperature up to 40.6° C. (105° F.), and finally into the hyperpyrexial or intense form of heat stroke, in which the bodily temperature has been known to rise to the phenomenal height of 47.6° C. (117.8° F.). That the elevation of bodily temperature is the result of an elevation of external temperature and humidity combined has been well shown by various British authorities,[2] whose information is drawn partly from laboratory experiments and partly from observations in mines and factories. Haldane[3] summarizes the results of his observations as follows:

> These experiments proved that in very warm air it is the temperature indicated by the wet-bulb thermometer (not the actual air temperature as shown by the dry-bulb thermometer, nor the amount of moisture in the air, nor the relative humidity) which determines the ill effects produced. With a wet-bulb temperature exceeding 88° to 90° [F.=31° to 32° C.] in fairly still air the body temperature begins to rise, even in the case of persons stripped to the waist and doing no work, and when once started this rise continues until symptoms of heat stroke arise, unless the person leaves the warm air. In the case of persons doing muscular work, the rise of body temperature is much more rapid and begins at a much lower wet-bulb temperature. It will, for instance, begin (in persons stripped to the waist) at a wet-bulb temperature of about 80° [F.=26.7° C.] in still air with moderately hard muscular work, so that hard and continuous work is impracticable at wet-bulb temperatures of over 80° in still air. There is no doubt that when ordinary clothes are worn serious rise of body temperature occurs at a still lower wet-bulb temperature. Soldiers march-

ing in uniform are, for instance, liable to heat stroke at wet-bulb temperatures of under 70° [F.=21° C.].

A second striking effect of a combined high temperature and high humidity is a disinclination or actual inability to perform active muscular work. Beginning as a mere inertness, accompanied by sleepiness, which may readily be resisted for a time, it may pass into a genuine condition of fatigue, and ultimately into the exhaustion of heat stroke. Haldane [4] says of the Cornish miners of tin and copper:

They do not * * * seem to be able to do more than a limited amount of work. The leisureliness of all work in the mine is in very striking contrast to what may be observed in any ordinary English colliery of about the same depth.

Pembrey,[5] after studying the effects of warm moist temperatures upon himself, medical students, and soldiers, concludes:

The results show definitely that a man is much less efficient in a warm moist atmosphere. * * * A man can do far more work with less fatigue at a low wet-bulb temperature than at a high one.

Pembrey and Collis,[6] in speaking of the physiological effects of the warm moist atmosphere of cotton weaving, say:

The natural tendency is for the nervous system to become less active and for muscular work to be diminished. In a weaving shed, however, the machine sets the pace and the worker must neglect the dictates of his sensations, which are the natural guardians of his health and well-being. * * * It is not surprising, therefore, that at the end of a day's work many of the weavers complain that they have no energy left, have no great desire for food, and need only drink and rest.

Boycott [7] says of mining in hot moist air:

My observations on miners * * * lead me to conclude that their power of doing work under these circumstances is quite small.

Cadman,[8] professor of mining in Birmingham University, and late H. M. inspector of mines, gives more detailed observations to the effect that from about 25° C. (77° F.) wet-bulb reading, exertion begins to be accompanied by depression, and disinclination to work increases rapidly with an increasing wet-bulb temperature. At 27.8° C. (82° F.) "if clothes be removed and maximum body surface exposed work can be done providing current of air is available." At 29.4° C. (85° F.) "only light work is possible"; and at 35° C. (95° F.) "work becomes impossible." Stapff [9] observed in the construction of the St. Gotthard tunnel that the laborers, working in an atmosphere often completely saturated with moisture and with a temperature rising at times beyond 30° C. (86° F.), as measured by the dry-bulb thermometer, experience not only great discomfort, but indifference, enervation, weariness, and exhaustion. These direct statements are supplemented by the testimony of many industrial workers and observers of industrial conditions to the effect that com-

bined high temperature and high humidity cause not only bodily discomfort but lessened power of labor. All who have experienced such conditions can not fail to agree with such testimony.

But the lessened power of labor under such circumstances may be real or only apparent. The sensations of fatigue which are undoubtedly present may diminish the amount of labor performed; but sensations of fatigue are often misleading and do not necessarily signify the presence of the actual physical basis of fatigue. Unfortunately there seems to have been made no exact comparative studies of the actual amount of labor which the human body is capable of performing under these abnormal conditions. This is but one instance of a lamentable lack of exact information regarding the capabilities of the body under different environmental conditions. This lack can be supplied only when we have devised adequate methods of testing the working powers of the living individual. Patrizi [10] has indeed shown that human muscles when subjected to localized hot baths, as by the immersion of the arms in hot water, and then stimulated electrically, undergo early fatigue and rapid exhaustion. This result is in harmony with those of Gad and Heymans [11] and others, who find that the excised muscles of frogs become rapidly fatigued when warmed. From all the available evidence therefore it seems probable that the actual physical basis of fatigue is present in a body working in a hot and humid atmosphere. A more detailed analysis of the physical and chemical conditions of such a body confirms this conclusion and, I venture to think, throws considerable light upon this hitherto obscure subject.

When in a hot and humid atmosphere the blood vessels of the skin are dilated and overcharged with blood, the brain and spinal cord, among other organs, are rendered correspondingly anemic. This is sufficient of itself to account largely for the feeling of weariness, the indifference and apathy toward laboring that are then present. The changed bodily sensations and the general bodily discomfort may also tend toward the same end.[12] But if the stage of elevated bodily temperature be reached, the internal conditions are still more radically changed. A febrile state, especially when pronounced and long continued, affords unusually good chemical conditions for the oncoming of fatigue. One of the striking metabolic accompaniments of the fevers that result from bacterial invasion of the living body is an increased excretion of nitrogen, which is derived, as is inferred from the work of various investigators, from an increased destruction of the proteins of the tissues, probably due largely to the direct action of the higher temperature upon them. This abnormal destruction of proteins appears to occur not only in fevers of bacterial origin, but in the hyperthermy produced by hot baths and in other ways. Schleich,[13] Formanek,[14] Edsall,[15] and others have found this

to be the case. It was long ago maintained that along with the increased destruction of proteins in fevers there is an incomplete oxidation of intermediate metabolic products. In this connection, it is interesting to recall that Mandel[16] finds purin bases to be increased and uric acid to be decreased in quantity in febrile urine. Furthermore, Geppert,[17] Minkowski,[18] and Kraus[19] argue from the diminished quantities of carbon dioxide in the blood and from other facts that there occurs an acid intoxication during fevers. Ammonia, indicating also the production of acids, is increased in output.[20] Acetone and even diacetic and oxybutyric acids have frequently been found in febrile urine.[21] While it is still in doubt whether these acetone bodies arise from destroyed proteins or from destroyed fats, the fact of their existence as intermediate metabolic products seems clear.

Whether analogous changes occur in the hyperthermy resulting from exposure to a hot and humid atmosphere has not yet been sufficiently investigated, but it seems altogether probable that in such cases there is at least a great disturbance of metabolism. The theory of auto-intoxication as the essential causative factor in insolation was first suggested by Vincent in 1888.[22] It was adopted by Van Gieson,[23] Levene,[24] and Lambert[25] in their investigations of sunstroke during the extraordinary occurrence of that disease in the city of New York in the summer of 1896. The symptoms of the disease suggest strongly the presence within the body of an acute poison. Levene found that the blood serum of two patients suffering from the disease, as well as the urine of convalescent patients, was acutely toxic to rabbits; and although he was unable to demonstrate any increased nitrogenous metabolism he came to the conclusion that the symptoms of sunstroke result from an auto-intoxication due to some kind of a pathological decomposition of tissue. Van Gieson described histological changes in the nerve cells of the brain and spinal cord which are closely similar to those produced by various poisons, such as other auto-intoxicants, bacterial toxines, alcohol, and lead. Analogous lesions have been observed in either insolation or artificial heating by Goldscheider and Flatau,[26] Marinesco,[27] and Amato.[28] Various investigators[29] have found that when the temperature of the body has been raised, either experimentally or in insolation, the alkalinity and coagulability of the blood may be diminished. Another fact of significance is the unusually early appearance of rigor mortis and decomposition after death from insolation,[30] which suggests that an acidity may have developed in the muscles. From these various observational and experimental data it may be inferred, if not with certainty at least with a high degree of probability, that the subjection of a body to an external temperature and humidity sufficient to raise the internal temperature to a pathological degree causes

metabolic changes, the nature of which is not yet known but which interfere profoundly with the normal working of internal mechanisms.

Fatigue is a physical phenomenon, a lessened power of work, which has as its basis certain metabolic phenomena. The two chemical causes of fatigue have long been recognized as the diminution of substance that is essential to activity and the accumulation of metabolic products that are toxic or depressing to the tissues. Of these fatigue substances carbon dioxide and lactic acid appear to play a prominent rôle in the production of normal fatigue.[31] It is probable, as I have elsewhere maintained,[32] that these are but types of other metabolic substances which act similarly. This is seen most clearly in certain pathological conditions. It is well known that in diabetes, for example, there exists an acid intoxication conditioned by the presence in the blood and tissues of β-oxybutyric acid and other acetone bodies. I have been able to show that when β-oxybutyric acid, either free or as a salt, is administered by irrigation to a muscle, the muscle behaves as if it had been fatigued by exhaustive labor, and I have explained the well-known proneness to fatigue of an individual suffering from diabetes as due in considerable part to the direct action on the tissues of β-oxybutyric acid and perhaps other associated pathological fatigue substances. It is probable that a similar explanation will hold for inanition, the pernicious vomiting of pregnancy, and the various other instances of acid intoxication, all of which are characterized by marked fatiguability. What has been said of β-oxybutyric acid is equally true of indol, which likewise is depressing to muscle and the presence of which in abnormal quantities within the body is associated with a similar tendency to fatigue.[33] It has been maintained[34] that the inability to perform continued labor that is so pronounced in neurasthenia rests likewise upon analogous metabolic causes, the identity of which has not yet been established. I think it probable that future research will greatly extend our knowledge of the metabolic bases of fatigue. Especially do I look for such a rôle to the intermediate metabolic products which may be present in abnormally large quantities in various pathological states. Such a conception too appears to me to afford the most probable explanation of the fatigue that appears to be present when the individual is endeavoring to labor in an atmosphere at a high temperature and a high humidity. Here he has to contend not only with his normal fatigue substances, but with the pathological substances that result from the peculiar conditions of his labor.

But there is a further factor to be considered. More than a hundred years ago Alexander von Humboldt[35] observed that heat increases the action of various chemical substances on various forms

of living substance, such as the heart and the motor nerves. This has since been studied in many ways by many investigators, such as Hermann,[36] Kronecker,[37] Luchsinger,[38] Lauder Brunton,[39] Richet,[40] and others, and it has become recognized as a general law that the temperature at which poisons act upon living substance is a factor, as in other chemical phenomena, in determining the degree of their action—at a higher temperature their action is more intense. There seems to be no reason why this law should not apply to the case under consideration. This suggestion has indeed been made for normal fatigue substances by Patrizi[41] to explain the ready fatiguability of human muscles submitted to localized hot baths. With even greater weight it can be applied to the human being laboring under the disadvantageous conditions of excessive temperature and excessive humidity. Normal and pathological fatigue substances are here present in solution in an overheated body. If they are toxic at normal degrees of temperature, their toxicity is more pronounced at higher degrees, and in proportion as mechanical work is performed and internal temperature rises, the more is working power lessened.

I may, therefore, summarize my thoughts as follows: When an individual is subjected to an atmosphere that is charged with an excessively high temperature and high humidity, his bodily temperature is raised, his working power becomes limited, and there is an early oncoming of fatigue. In addition to the normal fatigue substances there are present other substances, products of an abnormal metabolism, perhaps of increased protein disintegration, which likewise act as fatigue substances. Both the normal and the pathological fatigue substances act toxically to diminish the activity of the tissues, and such fatiguing action is rendered greater by reason of the abnormally high internal temperature that is present.

If these considerations, presented from a purely scientific standpoint, are worthy, their significance ought to be more than merely academic. Industrialism presents numerous instances in which human beings are obliged to labor under the conditions here outlined. Constant submission to these conditions is detrimental to the well-being of the individual and ultimately of the race. This is an unnecessary situation, which sooner or later is bound to be relieved. It is the duty of men of science not merely to discover the conditions under which men labor, not merely to show how an environment is detrimental, but to use their influence to make of labor a physiological rather than a pathological exercise.

[1] Rubner; Lehrbuch der Hygiene, 8th Edition, 1907, p. 90.

[2] Reports of the Departmental Committee on Humidity and Ventilation in Cotton Weaving Sheds, London, 1909 and 1911.

[3] Haldane: Report of the Departmental Committee, etc., 1909, Appendix III, p. 218.

[4] Haldane: Journal of Hygiene, 1905, V, p. 498.

[5] Pembrey: Report of the Departmental Committee, etc., 1909, Appendix IV, p. 221.

[6] Pembrey and Collis: Second Report of the Departmental Committee, etc., 1911, Appendix III, p. 24.

[7] Boycott: Report of the Departmental Committee, etc., 1909, Appendix V, p. 222.

[8] Cadman: Report of the Departmental Committee, etc., 1909, Appendix VIII, p. 225.

[9] Stapff: Archiv für (Anatomie und) Physiologie, 1879, Supplement Band, p. 91.

[10] Patrizi: Archives italiennes de biologie, 1893, XIX, p. 105.

[11] Gad und Heymans: Archiv für (Anatomie und) Physiologie, 1890, Supplement Band, p. 59.

[12] Hough: American Journal of Public Hygiene, 1910, XX, p. 267.

[13] Schleich: Archiv für experimentelle Pathologie und Pharmakologie, 1875, IV, p. 82.

[14] Formanek: Sitzungsber. d. Kais. Akad. d. Wiss. Math.-nat. Cl., Wien, 1892, 101, p. 278.

[15] Edsall: Transactions of the Association of American Physicians, 1909, XXIV, p. 625.

[16] Mandel: American Journal of Physiology, 1904, X, p. 452; 1907, XX, p. 439.

[17] Geppert: Zeitschrift für klinische Medizin, 1881, II, p. 355.

[18] Minkowski: Archiv für experimentelle Pathologie und Pharmakologie, 1885, XIX, p. 209.

[19] Kraus: Zeitschrift für Heilkunde, 1889, X, p. 106.

[20] Erben: Zeitschrift für Heilkunde, 1904, XXV, p. 33.

[21] MacCallum: Archives of Internal Medicine, 1909, II, p. 594. Also Harvey Lectures, 1908–9, p. 27.

[22] Vincent: L'hyperthermie. Thèse de Bordeaux, 1887–88. No. 8.

[23] Van Gieson: New York State Hospitals Bulletin, 1896, I, p. 475; Medical Record, 1900, LVII, p. 1134.

[24] Levene: New York State Hospitals Bulletin, 1897, II, p. 357.

[25] Lambert: Loomis and Thompson's A System of Practical Medicine, 1898, article on "Insolation"; Medical News, 1897, LXXI, p. 97.

[26] Goldscheider und Flatau: Fortschritte der Medizin, 1897, XV, p. 245; do., 1898, XVI, p. 124. Cf. Moxter, do., p. 121, and Goldscheider und Brasch, do., p. 126.

[27] Marinesco: Comptes rendus de l'Academie des Sciences, Paris, 1906, CXLIII, p. 853.

[28] Amato: Virchow's Archiv, 1909, CXCV, p. 544.

[29] Wood: Sunstroke, 1872, pp. 86 and 93; Thermic Fever, Pepper's System of Medicine, 1886, V, p. 392. Lambert: *Loc. cit.*

[30] Lambert: *Loc. cit.*

[31] Lee: Journal of the American Medical Association, 1906, XLVI, p. 1491; also Harvey Lectures, 1905–6, p. 169; American Journal of Physiology, 1907, XX, p. 170; Popular Science Monthly, 1910, XXVI, p. 182.

[32] Lee: British Medical Journal, 1906, II, p. 1806.

[33] Lee: in Herter's The Common Bacterial Infections of the Digestive Tract, 1907, p. 254.

[34] Cowles: Neurasthenia and Its Mental Symptoms, 1891; cf. also Ballet: Neurasthenia, translated by P. Campbell Smith, 1911, translator's preface, p. xix.

[35] von Humboldt: Über die gereizte Muskel und Nervenfaser, 1797, II, p. 218.

[36] Hermann: Archiv für (Anatomie und) Physiologie, 1867, p. 64.
[37] Kronecker: Archiv für (Anatomie und) Physiologie, 1881, p. 357.
[38] Luchsinger: Thermisch-toxicologische Untersuchungen, in Grützner und Luchsinger's Physiologische Studien, 1882, p. 33.
[39] Lauder Brunton and Cash: Journal of Physiology, 1882, IV, p. 1.
[40] Richet: La chaleur animale, 1889, p. 213.
[41] Patrizi: Loc. cit.

FATIGUE FACTORS IN CERTAIN TYPES OF OCCUPATIONS.

SHEPHERD IVORY FRANZ, Ph. D., psychologist and scientific director, Government Hospital for the Insane, Washington, D. C.; professor of physiology, George Washington University, Washington, D. C.

Certain factors which have influenced the course of fatigue have, for certain simple types of work or occupations, been carefully investigated. Thus, the rapidity of the operation, the amount of force needed in its performance, and the effects of some external conditions, such as meteorological, have been the subjects of numerous researches. Most of the investigations have, however, been planned and performed with the view to the acquisition of facts which may help to elucidate certain purely scientific questions, such as the nature of fatigue, its location, whether central or peripheral or both, and the relations of the fatigue effects, as lessened mechanical work, to the mental noncomitants which are known as feelings of fatigue or soreness.

While the facts which have been accumulated are of value for the understanding of the elements affecting fatigue in any condition of work, they are not always directly applicable to the solution of the problems of fatigue in occupations. One of the reasons for this is that the experimental conditions have been too greatly simplified, and they do not tend to approach the actual conditions in the factory or workshop. The purely practical problems differ in many respects from those of the greatest scientific interest, and it is not to be wondered that the methods in the latter must have been simple. On the other hand, it must not be forgotten that, in as far as an occupation consists of a simple movement or operation, the results of the fundamental scientific investigations may be directly applied toward an understanding of the fatigue effects and conditions in the workroom as well as those in the laboratory.

It has sometimes been hastily assumed that the effects of fatigue are always to be noted in a reduction in the amount of mechanical work, as measured in foot-pounds or kilogram-meters, or in the number of movements or operations which can be performed in a certain amount of time. There is, however, another factor which in certain types of occupations is much more important than the quantity of

work or its force. This is the accuracy of the operation. There are three factors on the motor side in every kind of occupation. These are (*a*) the quantity or the force of the work, (*b*) the number of pieces that can be made, or the rate, and (*c*) the accuracy or fitness of the manufactured article for the purposes for which it was intended. In all operations the time element is a kind of common factor, although in some the emphasis is placed upon the force or the quantity of the work, and in others there is a strain after accuracy as well as speed. Thus, in shoveling coal, it is important that the coal heaver take upon his shovel a certain amount of coal if there is to be a maximum amount of mechanical work performed in a given time. Similarly, in the hewing of a tree, the force must be great and must be expended at definite intervals in order to have the work accomplished in the shortest time. On the other hand, accuracy in handling the material is the essential in such operations as sewing, typewriting, metal stamping of certain kinds, and so forth. In the last-named occupations the amount of mechanical work in each operation is almost negligible, although the total for a day or hour may be considerable. In tree cutting and in coal shovelling, although the emphasis is placed upon the amount of mechanical work performed, accuracy is also demanded, for if the coal is not shovelled into the bucket or into the chute, energy is being expended without a corresponding performance of work desired, and if the axe, in tree cutting, is not accurately directed, the maximum amount of cut will not be attained. In sewing, although the emphasis may be placed upon the straightness or accuracy of the seams, it must not be forgotten that the handling of the cloth involves mechanical work in foot-pounds or kilogram-meters. In typewriting the amount of mechanical work performed in hitting one key may not exceed that of 50 grams by 15 millimeters, but when this movement is performed for several hours at the rate of about four movements a second, the total is very great.

Because most of the previously published investigations had been concerned with the relation of the speed and the amount of mechanical work that could be performed, it was planned to carry out a series of tests to determine the relation of accuracy of movement to speed. Three separate but interrelated problems suggested themselves as being open to a laboratory investigation. These were (1) the relation of the speed of performance to accuracy, (2) the relation of the extent of the movement to its accuracy, and (3) the effects of changing of speed upon the accuracy of performance. Regarding certain of these problems we have facts which indicate that the accuracy decreases as the speed is increased, although not in direct proportion (Woodworth), and that the accuracy is less when the movement is greater, but here also not in direct proportion to the extent of the movement (Fullerton and Cattell, Woodworth). When

there is only one simple movement to be performed, even though this be performed many times, and the movement be of considerable extent, great accuracy can be attained and kept up for long periods. Observations have been recorded by Woodworth of four laborers who were hitting hand drills with small hammers which illustrate this point. In 4,000 movements there was only one error in hitting the head of the drill with the hammer. Since the movement of striking was about 1.5 meters in extent, this would indicate that there was a small average error in direction of about one-third of a degree, or approximately of 0.9 centimeter.

The present work was more complicated, as far as the movements were concerned, than previous work to make it comparable with the simpler, but not the simplest, occupations, in that five movements were to be made. A form was constructed as a target with five points. These points were arranged in the form of an irregular pentagon, with the distance between the first and second points of 50 millimeters, between the second and third 75 millimeters, between the third and fourth 100 millimeters, between the fourth and fifth 50 millimeters, and between the fifth and the starting point 100 millimeters. Instead of having the subject strike the apical points of the pentagon, circles of 5 millimeters diameter were used, so that the subject might have a margin of error in the movement, as operators have in their occupations. The subject was instructed to hit with a pencil point, and in time with a beating metronome, each of the five points in succession, and start again after having completed the round. Each experiment consisted in the hitting of each circle on the target 25 times, making a total of 125 hits. In these experiments eight subjects were used, and the rates were changed after every second target, so that in a test with 12 targets there were four targets at each of three speeds, 1 hit a second, 2 hits a second, and 3 hits a second. In another series four speeds were used, 1.5, 2, 2.5, and 3.5 hits a second, respectively, but the individual tests were kept at the same constant speed. In the first series there were available for computation the results of 72,000 hits, and in the second series the results of 25,000 hits. The present communication is a preliminary account of the results of this study.

In calculating the results not only were the actual misses counted, but the average error of the misses was also taken into account. For those misses which were within 5 millimeters of the circumference of the circle an error of 1 was charged, and errors beyond this were counted 2, 3, 4, and so on, according to their distances from the circle.

RESULTS IN SERIES A.

At the slowest speed, the number of errors, in accordance with the method of calculation adopted, was less than two at the beginning

(first 625 hits), but the number gradually rose until, at the end of the series, it averaged nearly 60 per 100 hits. At the intermediate rates of 2 and 2.5 hits per second, the initial errors were about 21 and 36, respectively, and there was a gradual rise in the error moment until almost the end of the series, when the errors were, respectively, 88 and 94. At the quickest rate, the initial error was as high as the final error in the next lower speed, namely, 94, and there was also a gradual rise throughout the series, especially during the first half, until the final error was 187.

Since the results here presented for this test are those for only one subject, it is not surprising that the error curves for speeds 2 and 2.5 partly coincide, for the tests in these series were performed on different days, and there may have been a better physical condition, and consequently less original fatigue effect, before the beginning of that particular series. It was found, in fact, that the errors with speed 2.5 were less on the sixth, seventh, and eighth sets of tests (625 each).

The errors for speed 3.5 are interesting, for that speed was the highest with which this particular subject could carry out the program of hitting at the circles. After the first five sets, the errors reach a maximum and remain there throughout the remainder of the experiment. It is probable that if the test had been continued a longer time, the amount of the error would not have increased to any appreciable extent, for during the last tests the circles were scarcely hit at all, the hits falling about the circles, and at considerable distances from them. Probably the maximum error period had been reached previous to that of exhaustion, at which time the subject would not have been able to hit at the target circles.

A comparison of the curves [1] for the serial tests and those for equal intervals of time in these experiments is interesting, for it is seen how soon fatigue sets in with the higher speeds, and how slow the fatigue effect forms when the speed is such that even short periods of rest intervene between the individual movements. The full effect of fatigue for the greatest speed was found to come within 20 minutes, while with the intermediate speeds of 2 and 2.5, the errors at the end of 45 minutes were only about as large as those in the initial test at the highest speed.

RESULTS IN SERIES B.

In the second series of experiments, eight subjects were used on six different days, with alterations in the rates of hitting the targets. Two experiments with one speed were made, then another speed with two experiments, and a third speed with two experiments, and so forth. Here, instead of the rate being kept constant, as in the first series, there were twelve targets used, four at each of three speeds,

1, 2, and 3 hits a second, and each target having 125 hits. The combination of results from all subjects at the three different speeds show that, as in the first series, the inaccuracies at the slowest speed are insignificant, those at the middle speed are many times greater, and those at the high speed are more than proportionately greater than those of the medium speed. Since the number of movements in this series was not much greater than those considered in the first two tests of the first series (250 at each point of the curve for each subject, as compared with 625), there is not to be expected the same amount of rise in the curves, to indicate the fatigue effect. When the tests are combined by threes, we do find a distinct rise in all the curves, although not as much as in the corresponding two periods in series A. The decrease in the error in the last test with speed 3 is comparable with the results in series A, in which similar slight reductions in error were found toward the end of the experiments. These results are comparable with those found in other fatigue tests, in which it has been repeatedly noted that the end of a series, when known, has an apparently stimulating effect upon the subject. In this way I would account for the reductions in inaccuracies.

An examination of the individual records of errors in relation to the three speeds, regardless of the serial number of the test, is interesting, in that it shows great variations in error for the three speeds. Some subjects are accurate for slow speeds, but very inaccurate for the higher speeds; others are inaccurate at all speeds, although the errors increase greatly as the 3-a-second speed is assumed.

The errors for the individual dots are also important to note. The results show, in general, that the movement of least extent is, on the whole, much more accurate than that of greater extent. In the experiments of this series if there be omitted from consideration the return to the starting point, there is a direct correlation between the errors and the distance. The first point should probably be omitted from consideration, since it was apparent that all subjects, in performing the tests, made them in 3–2 rhythm, thus dividing the work into two parts, and returning to the starting point, as if a new test were being made. Probably we should count the errors as the differences between the error for the first point and those for the other four points. Were this done, we should have a marked correlation, but not a direct relation, between the distances, and also the order of the hits.

One other matter needs brief mention. This is the relation of changing speeds to errors. When the speed was increased from one per second to two or three per second, there was found an increase in error much greater than that found when the rate was kept constantly at the higher figure. It would appear as if this "speeding up" process had interfered with the rhythmical activity of the neuro-

muscular apparatus in such a way that the adjustment was not as good. This phenomenon, although here stated to be found when the rate was changed from the slowest to one of the higher speeds, was also found to be present when the rate was changed from the medium to the high speed. A slight difference was also noted when the high rate suddenly gave way to a slower rate, although, in this latter case, the variation in accuracy was not as noticeable as when there was a change from slow to fast.

The following conclusions appear to follow from the experiments so far performed:

1. Fatigue is evidenced by inaccuracies in movement, as well as by the lengthening of the time of movement and by a decreased performance of mechanical work.

2. With increased speed, error increases, but the error increase is much greater than that of speed.

3. In extended series of movements at high speed there is a tendency toward a lack of coordination, evidenced by great errors and a smooth curve.

4. The error, or fatigue effect, at slow speed, at the end of about 6,000 movements, is about the same as that at medium speed after about 500 movements, and that at medium speed, at the end of about 6,000 movements, about the same as that at high speed at the end of about 500 movements.

5. Changing the rate of movement increases the proportionate errors, making them greater than those when the speed is a constant, and decreasing the speed increases the proportionate errors, although not proportionately as much as when there is an increase in speed.

6. The inaccuracy in movement increases as the extent of the movement increases, but is not directly proportional.

The relation of these facts to certain types of occupations, and to the process known as speeding up, is almost obvious, but the direct application must be reserved for future and more extensive communications.

[1] These were shown at the Congress sessions, but are not reproduced here.

THE STUDY OF FATIGUE AND ITS APPLICATION TO INDUSTRIAL WORKERS.

JOSEPHINE GOLDMARK, National Consumers' League, New York.

I. IN THE SCIENTIFIC STUDY OF FATIGUE, THE ESSENTIALS ARE AGREED UPON.

To an audience of scientists and medical men the results of the modern study of fatigue need not be detailed. Whatever the disagreements on special points, such as precise localization of the

fatigue of nerve tissue, the molecular storage of oxygen, and other similar problems, the essentials are agreed upon, and are, indeed, among the commonplaces of science.

This being so, what application can be made of this accumulated knowledge for the benefit of those most subject to the inroads of fatigue—the vast number of men, women, and children who form the industrial armies of the world, supplying men's needs and luxuries?

The existence of this congress, with its many sections and subdivisions, is a proof of the great diversity of lines along which science is advancing to seek the innumerable causes of human disease and misery.

II. FATIGUE AS A DANGER OF OCCUPATION HITHERTO NEGLECTED.

The object of this paper is to point out some aspects of scientific study hitherto neglected in the United States which may assist in combating that danger of occupation, which is more widespread than all others, because it affects the largest number of wage earners—not only those in the so-called dangerous occupations, but every worker, man, woman, or child who is strained beyond physiological limits by excessive labor.

Heretofore the scientifically well-known principles of fatigue have not been utilized in the protection of the workers just because they have been unknown to those persons who could have benefited most directly. To all these, in the main, the contributions of science on the subject have been unknown. To the scientist, on the other hand, the industrial world has been an undiscovered country. Even physicians and students of hygiene are to a large extent unacquainted with the vast speed, the complexity of processes, and the still intolerably long hours of labor to which industrial workers are subjected, especially in our country, where industrial development has been most swift.

III. SOME EXAMPLES OF OVERSTRAIN IN INDUSTRY.

From among the innumerable examples which might be quoted, I chose a few to illustrate how flagrantly some common industrial occupations—in themselves innocuous—are carried on in defiance of the most elementary physiologic laws.

Among workingmen the most striking examples of overwork are found in the continuous industries or in industries continuously carried on, whether or not technical reasons demand that the processes of work be uninterrupted. No recent revelations of working conditions have aroused such general condemnation as the prevalence of the 12-hour day and 7-day week in the steel mills.

The most recent Government investigation of the iron and steel industry in the United States shows [1] that, of the 172,671 employees whose hours of labor were reported in May, 1910, nearly one-half (42.58 per cent) were kept at work 72 hours a week or over—that is, at least 12 hours daily on six days of the week. Nearly a quarter of all the workers (20.59 per cent) were kept employed 84 or more hours in the week—that is, at least 12 hours each day, including Sundays. In the largest single department in the industry, the blast furnaces, 88 per cent of the 31,321 employees, engaged in both productive and general occupations, were regularly kept at work 7 days in the week.

Among wage-earning women, two occupations may be cited as examples of the intolerable conditions of work still habitual among us. The first of these is an occupation which women have followed from time immemorial—the work of the laundry, common to all civilized nations; the second is an occupation practically new to the girls and women of the last decade—the telephone service.

During the winter of 1912 an official investigation was made of motor laundries in New York City by the bureau of arbitration of the State department of labor. The three following schedules of "long weeks" were reported among others in the stenographic minutes of evidence, and, while they need not be regarded as typical, they show to what extremes the employment of women is carried in the absence of effective regulation:

Day of work.	Woman who has worked 2 years in laundries.	Woman who has worked 5 years in laundries.	Woman who has worked 11 years in laundries.
Monday	12 noon to 12 p. m.	12 noon to 12 p. m.	—— to 9 or 10 p. m. (latest 1 a. m.)
Tuesday	9 a. m. to 11.30 p. m.	9 a. m. to 11.30 p. m.	9 a. m. to 11 p. m.
Wednesday	9 a. m. to 9.30 p. m.	9 a. m. to 9 p. m.	9 a. m. to 8 p. m.
Thursday	9 a. m. to 7 p. m.	9 a. m. to 7 p. m.	9 a. m. to 7.30 p. m.
Friday	9 a. m. to 6.30 p. m.	9 a. m. to 6 p. m.	9 a. m. to 6 p. m.
Saturday			

Regarding the telephone service, and its strain upon the energies of telephone operators, we are fortunately not thrown upon surmise, but have expert testimony. It should be borne in mind that the simplest form of telephone connection requires 11 different processes to be performed in instant succession by the telephone operator; she works, for the most part, at the top notch of expectancy, making and severing connections with all the speed she may. The constant flashing of signal lights on the board in front of her and the buzzing sounds heard in her ears when impatient subscribers jerk their telephone hooks add to the strain of the work. Five years ago a Canadian royal commission intervened in a dispute between the Bell Tele-

phone Company, of Toronto, and their girl employees. The commission called upon 26 prominent physicians and neurologists for evidence concerning the physical effects of the work. The most important points brought out were the following:

1. Work at the telephone switchboard is not only a severe strain on the special senses of hearing, sight, and touch, but particularly on the nervous organization of the operators. Many examples were cited of operators whose health had been seriously impaired by the work.

2. It was agreed that rest or relief periods of not less than 20 minutes after each two hours of work were essential to preserve operators from exhaustion.

3. The maximum number of hours per day deemed compatible with health was 7 hours, broken by the proper relief periods.

In glaring contrast to these carefully considered medical opinions stands the Government report on the telephone service in the United States.[2] Overtime work beyond even the 9 or 10 hour day, relief periods curtailed or granted only as favors, the very general requirement of much Sunday work without any other compensating holiday, overloading, or the imposition of calls per operator beyond the known "breaking point of efficiency"—all these avoidable hardships exist in greater or less degree throughout the country. In the enlightened city of Boston, for instance, in June, 1912, a strike of telephone operators was avoided, after much conference, only by conceding to them requirements still decidedly exceeding the minimum laid down 5 years earlier by the Canadian physicians. They obtained the promise of 15-minute reliefs after each 3 hours of work, and an 8-hour workday, not however, to go into effect until after the summer, when the service is most exhausting.

Besides work in laundries and in the telephone service, a general industrial usage may be pointed out which is common to almost all industries, and which contributes to the overwork of wage earners to a degree unsuspected by most persons. This is the system of overtime.

Overtime is an elastic term. In its most extreme form it lengthens the workday to 24 hours in one stretch. In less extreme degree, overtime is worked during the fall months until 8 or 9 or 10 o'clock each evening in factories which supply the Christmas market; in paper-box making; in the manufacture of innumerable articles of women's wear, from lace collars to Japanese kimonas; in leather and jewelry work; in making the cheaper and more lasting candies, and in many other occupations. In fact, overtime is an integral part of the workers' lives, persisting not only for days at a time but for weeks and months; not occasionally lengthening the day's work,

but during a large part of the year straining health and endurance to the utmost.

Thus, in the recent Federal investigation of wage-earning women and children, agents of the Government reported the normal hours of work, in miscellaneous manufactures, as 55½ in New York, 56.4 in Chicago, 53.3 in Philadelphia, 53 in Baltimore. But the average duration of overtime of selected workers in those cities during 1907–8 was 17.3 weeks, or over four months, in New York; 13½ weeks, or more than three months, in Chicago: 16.6 weeks, or again over four months, in Philadelphia; and 13 weeks in Baltimore.[8] In one printing establishment in New York City girls were employed overtime once and sometimes twice a week during a period of 16 to 26 weeks for 16¾, 20¼, 22½, and 24½ hours.

The essential injury of overtime is due to what has been graphically proved in the laboratory with the ergograph, because effort increases with fatigue, because work continued after fatigue has set in requires so much more subsequent time for recuperation. But during a "rush" or overtime season such time for recuperation is necessarily lacking. The girl who is kept in the great department stores until 11 or 12 or 1 o'clock at night during one or two frenzied weeks before Christmas, the girl who works at fever heat all evening stitching women's shirt waists in January for the spring trade, is not relieved from the necessity of reporting for work the next morning. She comes to work unrepaired, and with each day of overtime accumulated fatigue necessarily grows.

IV. TWO METHODS OF COMBATING INDUSTRIAL OVERSTRAIN—LEGISLATION AND EDUCATION OF EMPLOYERS.

These examples show how employments, in themselves innocuous, become unmistakably dangerous to health through the overfatigue and exhaustion they engender, and they are merely typical of countless other employments in which hundreds of thousands of girls and women are engaged. Fatigue is thus a danger of occupation as truly as any of the industrial poisons, and it must be recognized as such if it is to be combated.

It is precisely here that the aid of science is so urgently needed and has hitherto been almost wholly lacking. The most hopeful methods of combating overfatigue and exhaustion in industry are two: Legislation prohibiting excessive hours of labor and the education of employers. Neither method is sufficient alone. Legislation is still the cardinal need, since, after a century of experience, the factory codes of the most advanced industrial country must still be called the "minima of protection" for the workers. For the employer, too,

who desires the best efficiency of his workers, such legislation is essential to protect him against the successful underbidding of unscrupulous competitors.

V. OBSTACLES TO LEGISLATION LIMITING THE WORKDAY.

Legislation limiting the workday to a specific number of hours (in only two of our States less than 10 hours per day) is, indeed, a crude gauge of working capacity. Yet, at the present time, it is the only available gauge, and the mechanism of enforcement, through improved factory inspection, must be perfected in this country before we shall be prepared to enforce more rational and more physiological limitations based on variations of work and of individual capacities.

So far are we still from a more accurate scientific gauge of working powers that 19 States have as yet no legal limitation whatsoever of woman's hours of labor. Among these are the great industrial States of North Carolina and South Carolina,[4] employing in manufacture, in the year 1910, respectively, over 21,000, and over 12,000 women, Georgia,[4] too, Alabama and Mississippi, each with thousands of women at work, have as yet failed to enact any laws protecting women from excessive hours of labor. These are all Southern States; farther north, too, progress has been so slow that, of 16 States which have enacted laws shortening women's hours of labor during the past two years, 7 States took such action for the first time, having never before the year 1911 afforded any such legislative protection whatsoever to adult women. These States were California, Kentucky, Maryland, Missouri, Ohio, Utah, and Wisconsin. Until the year 1912 the Empire State of New York, where nearly 300,000 women were employed in manufacture alone,[5] provided by law the inhumane 12-hour day, abandoned almost a century ago in British textile mills. To this day the great industrial State of Pennsylvania, third only to New York and Massachusetts in value of products, allows by law the 12-hour day for more than 168,000 women employed in manufacture.

Only 19 States protect women from excessive hours in the exhausting service of the modern department store, and conspicuous by their absence from this list are States with great commercial centers like New York, Ohio, and Rhode Island. Only 10 States[6] regulate by law the hours of women's work in the taxing employment of the telephone service and of these 10 six States still prescribe the 10-hour day, thus lagging behind the usage of the best companies.

So meager and so recent are even these crude measures of protection in our country, 38 years after Massachusetts enacted the first 10-hour law for women. It is, of course, true that in many of our States legislation has lagged because it has not been needed. In the

last census less than 4,000 women were reported employed in manufacture in the whole mountain division comprising eight States: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, and Nevada.

But, where protection is most acutely needed, where the great woman-employing textile and clothing trades are located, the opposition of powerful interests is met.

It is the cotton lobby which throws its great influence against the workers in the cotton States, the glass lobby in the glass States, the laundrymen's association, wherever legislation for laundry workers is proposed, the retail dealers' association, against any relief for shop girls. Individual employers, it goes without saying, are humane and enlightened, but their official organizations and representatives have won a sinister distinction in opposing labor legislation. Such associations of employers as those named above are found officially in the field at every session of the State legislatures. It was, for instance, the Illinois Manufacturers' Association which officially combated any restriction whatsoever of women's hours in Illinois, and failing to defeat the passage of the 10-hour law in 1909, bent all their energies, fortunately without success, to have the law annulled by the courts. It was the laundrymen's association which played the same part in Oregon in 1907, and even carried a case, also unsuccessfully, against the Oregon 10-hour law to the United States Supreme Court. It is the Retail Dry Goods Merchants' Association of New York City which, by fair means or foul, has succeeded in stifling all limitation of hours for adult women employed in department stores.

Now, it is precisely in opposing these powerful opponents, and in educating employers to a realization of true efficiency based on the physical fitness of their operatives, that the active support of scientific and medical men is essential for progress.

True, the scientific man is chary of ascribing to isolated and single causes such complex phenomena as the physical and nervous overstrain which is making itself manifest among working people throughout the world. The contributing and concomitant causes of underpayment, worry, bad living, and similar evils must be counted in any effort to appraise the strain of industry. Yet, two simple reasons exist for isolating the excessive duration of working hours, and for holding that duration to be the most important point of attack. The first reason is practical, because the excessive hours of labor can be curtailed and regulated by legislation, while better conditions within the home, better sanitation, nutrition, and hygiene can come only by slow process of education, as people are gradually taught to recognize such needs.

But there is a second and more fundamental reason for attacking the system of long hours. The shortened workday and relief from overstrain are not in themselves the cure for the ills which have been

created, but they are the sine qua non, without which no other cure is possible or conceivable. Nothing can cure the exhausted worker and restore the buoyant resistance from which alone health and efficiency spring, which does not allow time for tissue repair and recuperation.

Yet with single notable exceptions, what effective or concerted action have physicians and scientists in the United States, either as individuals or in their associations, taken in regard to this simplest factor of the wage earners' lives, yet the one most fraught with possibilities of danger, the duration of their working hours? In America, until within the past few years, it has not even been recognized as a subject worthy of scientific interest or attention. The modern study of fatigue and normal metabolism has been hitherto almost wholly divorced from the world of industry and labor, a world far removed from the specialized lives of most physicians and scientific men. Yet it is precisely the wage earners who most need to have applied to them the scientific knowledge accumulated in the laboratories to preserve them from forms of labor now tolerated among us.

What we need is a new study of undue fatigue in industry. We need to have transferred into the factory and workshop, and to the telephone switchboard and the crowded department store, the kind of research which has yielded so rich a harvest in the laboratories. Both for a more rational organization of business and for intelligent legislation, we need definite knowledge of the effects of such industrial facts as those which we have briefly reviewed. We need to know, from systematic and continuous study, what are the actual results of speeding, and piecework, monotony and mechanical rhythms, and other incidents of industrial life. The workday is too long when it goes beyond physiological limits; in other words, when no adequate margin of rest is allowed for tissue repair. We need to know, for the various trades, and for the various operations in those trades, what is an adequate margin of rest. We need to know whether nervous diseases are on the increase among industrial workers in this country, as they are reported to be abroad by the statistics of the insurance societies. We need, above all, men of the highest caliber and professional standing to plan such investigations along broad inclusive lines, so as to discount what is transient and temporary, and to obtain the underlying facts, for the conservation of health and efficiency.

In the interests of efficiency many enlightened employers already provide medical supervision of the hygiene of their employees. These agencies could well be used for such systematic and continuous study as we have advocated. Once the importance of the subject is realized, once overstrain itself is recognized as a danger of occupation, study of overwork and its sequelæ must follow.

Another source of information on the effects of industrial overpressure has been hitherto unused. This is in the records of the clinics and hospitals where working people are treated. In this country we have not the opportunities afforded by the foreign insurance systems to study sick and convalescent wage earners. But from the thousands of working men and women to whom the hospitals minister yearly could we not learn those antecedent facts as to the strain of employment to which foreign insurance physicians have been forced to turn in the interests of prevention? The social service work established in connection with various hospitals, precisely for prevention, is a first step in this direction. The out-patient department in many hospitals follows patients into their homes in order to make sure that the benefits of hospital treatment are not immediately undone by unhygienic living. This work could well be supplemented by obtaining and keeping accurate records of the industrial as well as the medical history of patients. No better work for prevention could be done than by attempting to discover those elements in industry which contribute directly to the illnesses of thousands of workers and carry them, year by year, in throngs to the hospitals.

Through the nurses who visit patients in their homes and establish confidential relations with them the machinery for such an additional inquiry is available. The medical examination and record of patients at the hospitals give their physical histories in full. An invaluable additional body of information could be secured if detailed records were systematically kept during a series of years showing the previous trade history of patients, their previous hours of work, the length of overtime work at rush seasons, their night work, if any, the machinery or processes at which they were employed before illness, and many similar questions. These histories, to be accurate, would have to be corroborated by a separate industrial investigation of previous places of employment to confirm the workers' accounts of themselves. Such an investigation could be kept within manageable limits by confining it to the year or two years previous to the worker's illness.

The value of such an investigation would be cumulative if it could prove, after a series of years, by large numbers of individual and well-authenticated cases, the important part played by overstrain in the production of disease and ill health among wage earners.

Such case study of wage earners who have succumbed to illness has some advantages over the more general study of wage earners at work. What we seek to know is precisely what is implied in the Italian phrase, "the pathology of labor." Just as in medicine the study of pathology goes hand in hand with the study of physiology—

the morbid as well as the normal reactions often yielding most suggestive clues—so in industry not only the physiological but the pathological aspects must be scrutinized—the infectious diseases, anemias, nervous disorders, pelvic derangements in women, and the rest.

It is, in the last resort, those who succumb who must determine the dangerousness of any trade. Thus, for instance, many men no doubt can and do work in caissons without contracting the dreaded "bends." Yet the legislation which prescribes special rules of hygiene for caisson work is based on the victims, not the survivors. Hence it is essential to learn from a scientific observation of the victims of industry—possibly in hospitals and clinics, as suggested above—those unhealthful and dangerous processes of industry which lead to physical disorder.

---

[1] Report on Conditions of Employment in the Iron and Steel Industry in the United States. Summary of wages and hours of labor, pp. 36 and 57. S. Doc. No. 110, 62d Cong., 1st sess., 1912.

[2] S. Doc. No. 380, 61st Cong., 2d sess., 1910.

[3] Report on Condition of Woman and Child Wage Earners in the United States, Vol. V, pp. 204, 208, 211, 213. S. Doc. No. 645. 61st Cong., 2d sess., 1910.

[4] South Carolina and Georgia have nominal 10-hour laws for factory employees, but these laws are nullified by their own wording.

[5] Thirteenth Census of the United States, 1910. Bulletin on Manufactures, p. 19.

[6] California, Illinois, Kentucky, Louisiana, Montana, Ohio, Oregon, Utah, Washington, and Wisconsin.

SOME CONSIDERATIONS REGARDING THE FACTOR OF FATIGUE WITH REFERENCE TO INDUSTRIAL CONDITIONS.

Prof. WILLIAM A. WHITE, Government Hospital for Insane, Washington, D. C.

Within the past few years a considerable literature has grown up with reference to the general subject of fatigue, and more recently it has been sought to utilize the results from the investigation of fatigue in helping to solve some of the industrial and occupational problems. While the mass of literature about these subjects is so large as to make any effort toward reviewing it at this time a practical impossibility, yet from it all there stand out certain general principles to which it is well worth while, upon an occasion of this sort, to call attention, while there are certain other fairly well accepted facts which belong within this same sphere but which have not yet received the recognition which is their due, to which attention also may be invited with some profit.

In the first place, the problem of fatigue has been most thoroughly worked over with reference to the subject of muscular fatigue and with the use of the nerve muscle apparatus. (Here the problem has been a relatively simple one, and yet, even with all its simplicity, there remain all sorts of questions to be answered, and the undisputed conclusions are few.) It is generally admitted, as a result of this kind of work, that fatigue has two factors—a negative and a positive, the former the result of an actual wearing out of the used substance, in this case muscle, and the second the result of the formation of certain poisonous substances, such as carbon dioxide, paralactic acid, and monopotassium phosphate. The term exhaustion has been very well proposed for this negative side of fatigue, while the word fatigue itself is used solely by some authors to indicate the positive side.

These results are results of the fatigue of muscle. The question of the fatigue of the nervous system is an entirely different one. As soon as an effort was made to define the actual place where fatigue occurred in the living animal, or the nerve-muscle apparatus, it was found to be no easy matter. In general, however, it may be said that the nerves themselves do not fatigue, and that the conception of the central nervous organs themselves showing fatigue, as is more particularly set forth by the experiments of Hodge, has changed materially of late years until it is now generally believed that the central nervous organs, like the nerves themselves, are little susceptible to fatigue. In the case of the nerve-muscle apparatus it would seem as if the nervous tissues were saved from fatigue by the fatigue of the muscle, or, more properly, both muscle and central nerve organs are saved from fatigue by fatigue of the motor end plates, in the same way that a dynamo may be saved from damage by the melting of a fuse. The classical experiment of Sherrington, which was to the effect that a muscle which is connected with a spinal-cord center, which center may be reached by several afferent tracks, responds as quickly to stimulation through one of these afferent tracks after one of the others has been so exhausted that no results follow stimulation, indicates that the locale of the exhaustion is at the synapse between the afferent and efferent neuron, and that, again, the central nervous organs are protected from exhaustion by this synaptic fatigue just as in the former case they were protected by the muscle fatigue. If these are the mechanisms, then it is readily seen that neither the central nervous system nor even the muscle itself can ever be seriously involved in fatigue; that the synpatic junctions and the motor end plates interpose obstacles to the occurrence of any serious disintegrating processes, and, therefore, are protective devices for conserving the organism.

MENTAL FATIGUE IS A STILL MORE COMPLEX PROBLEM.

We have no knowledge at all to-day of corollations between the symptoms of mental fatigue and any definite changes in the nervous system, and our means of measuring mental fatigue are, most of them, so complex when one comes to investigate them, and so contaminated by other than mental factors, that it is extremely difficult, in fact almost impossible, to evaluate the results. It is perfectly obvious, for example, that such instruments as the ergograph, the dynamometer, the æsthesiometer, and the algesiometer, all involve both mental and physical factors. When we come to take up the question of the symptoms of mental fatigue we realize that defect of attention is an important one of them. Then, when we realize that the whole attitude of psychology toward attention has been materially changing of recent years, and that attention is being more and more considered as an affective state, as an affective orientation of the individual as a whole toward a stimulus in the environment, the muscles naturally playing a very large part, it becomes evident that the difficulties are certainly very, very great.

At this point one can not resist drawing certain analogies. We have seen that it is fairly well conceded that the motor end plates and the synaptic junctions, by becoming impervious, prevent fatigue of the central nervous system; so it is a pretty generally accepted fact that, in the mental sphere, disorder of attention has the same conservative function. The person who can no longer pay attention is saved from the possibilities of serious fatigue, and this conclusion is in harmony with the more recent belief, *contra*, the original opinions following the experiments of Hodge, that the central nervous organs really do not suffer from fatigue.

In the face of these difficulties it would seem that we had better keep close to the fundamental principle of not mixing our categories, and so not endeavor to speak of fatigue in one category in terms of fatigue in the other. Let the mental and the physical, or, as symptoms, the psychic and the physiological, remain apart, and endeavor to determine questions of fatigue in the mental sphere purely by mental means. For this purpose probably the best method is Kraepelain's method of continuous additions.

This much I have said preliminarily, because questions of fatigue which arise in the consideration of industrial and occupational problems must almost invariably imply fatigue both of mind and of body. It will be seen, thus, that, in speaking of fatigue, we are still using a term of very vague connotations, and dealing with a condition that admits of measurement only with the greatest of difficulty. Not only this, but in the present state of our knowledge, it is practically impossible to state wherein the fatigue is resident,

what part of the individual really is fatigued, and what are the mechanisms, both chemical and physical, of that fatigue. The general gross fact which seems to issue from this complex situation is that human beings, worked under given conditions, tend to show a gradual falling off in the efficiency of their work, and that this falling off in efficiency can be prevented by changing the conditions, more particularly, by increasing the opportunities for rest, and that, further, when human beings continue to work under conditions which show a gradual falling off in efficiency, other manifestations tend to come into evidence, namely, various kinds and descriptions of disturbances of health. So that, with our present knowledge, it would seem more accurate, and perhaps wiser, to deal with the human being as if he were a machine, and with his efficiency as measured by his output, and endeavor to find what the conditions are which lower his efficiency, either impairing it temporarily, or tending to impair it permanently, and then endeavoring to discover what the conditions are which will prevent this temporary or permanent impairment, and so increase the efficiency.

I have been tempted to say what I have said, which is more particularly a plea for greater definiteness in the use of terms, by looking through the literature of fatigue, particularly in connection with various occupations, and noticing with what little regard for accuracy the term *fatigue* and certain other terms were used. I refer more particularly to the conditions which are presumed to be the results of mental fatigue. I find numerous papers, some of them by well-known men, showing the prevalence and the increase, particularly of neurasthenia and hysteria, in certain occupations, and I note the statistics, particularly those of foreign sanitaria, for the working classes, showing the immense increase in nervous diseases that have been admitted to these sanitaria in recent years. There appears to be very little in any of this literature that at all adequately accounts for these conditions.

In the realm of the neuroses and the psychoneuroses, such, particularly, as neurasthenia and hysteria, to which my attention has been called, the particular character of the work, or its severity, could by no possibility operate, if our present ideas of these conditions are correct, as adequate causes. Hysteria, for example, is a purely mental disease, dependent upon purely mental causes; in other words, psychogenic in origin. Work of any character or description, or of any degree of severity, could not be conceived to be a cause in any true sense. We all know that if we have some weak point in our bodies that it bothers us more when we are below par, and we are able to adjust to it better when we are in good health. The muscles of accommodation, for example, partake of the tone of the general

musculature, and when health is good they may give little trouble, but when the health is poor they may make difficulty. In the same way, and only in that way, can occupations or fatigue of any kind be said to be a causative factor of hysteria. They can only be adjuvant causes at best, and, at that, as you will see, unimportant ones.

With neurasthenia we are dealing with a condition which is not so prominently mental. In fact, neurasthenia, as we understand it to-day, is not a mental disorder primarily, but a physical disorder. However, the term "neurasthenia" is perhaps one of the most loosely used terms in medicine, and, as I see it through the literature that I have spoken of before, there appears to be no definiteness about its use. It is applied to all sorts and conditions of things, including the whole realm of the neuroses and the psychoneuroses, and probably some of the actual psychoses. Now we have a fairly well-defined syndrome to which the term neurasthenia is applicable, the symptoms of which are, in the main, a feeling of pressure on the top of the head, more or less insomnia, spinal irritation, with perhaps pain in the back, certain parathesias, easy fatiguibility, and emotional irritability. This may be a primary neurosis or it may be a secondary neurosis following upon other illnesses, such as prolonged sickness of some kind, or following an acute illness, such as typhoid fever. As a primary neurosis, it may be described as a primary fatigue neurosis, although it must be realized that the belief that it is due to fatigue, and that the symptoms are dependent upon the elaboration of toxic fatigue substances, is purely hypothetical. Even admitting the truth of all these things, however, there is absolutely no warrant, if our present concepts of this condition are correct, and they are being verified every day, for believing that occupation of any kind, or of any degree of severity, can be other than purely adjuvant and unimportant causes of this condition as in hysteria.

The limits of this paper prevent any extensive illustration of the opinions that I have just brought out with reference to hysteria and neurasthenia. Some of you will probably recognize that I have in mind the more recent hypotheses of Prof. Freud that would place both of these diseases, and a number of others, in the same category; namely, it would ascribe, as the necessary etiological moment in both cases, some sort of disturbance in the sex life of the individual, so that these diseases become of very greatest importance, not only because they are, as I have called them, social diseases, but their problems are essentially broader than the individual—they are biological problems. A single illustration will give you an idea of how I regard the situation:

We see in the literature, for example, that a great many of the telephone girls are getting neurasthenia and the cause is attributed to long hours of work, the extreme effort of attention that is neces-

sary because of the character of the work, and its constant annoyance and irritating character. All of these things are true, but if the modern hypothesis of neurasthenia, to which I have referred, is correct they can not be the fundamental causes. To speak broadly, we can only understand the neurasthenia in such cases by thinking of these girls as individuals who have been prepared by nature, up to a certain point, to fulfill a certain function and then, because of the exigencies of life or what not, all of the energies which have been developed in that direction are, so to speak, sidetracked and at about the period of puberty, when nature might expect physiological and psychological fulfillment, the individual is called upon to make a complete readjustment, to find entirely new avenues of outlet of nervous energy, to concentrate upon entirely alien interests. Now some people are so constituted that they can do this thing, so they succeed. Others are so constituted that they can not. They become neurasthenic or develop other neuroses, while certain others, and they are perhaps the most frequent, occupy a borderland position. These girls, under favorable conditions of employment, with plenty of opportunity for rest, good food, good housing, and all that sort of thing, manage to get along. With prolonged hours of work and irritating conditions, perhaps coupled with unhygienic and insanitary living, they break down. So you will see what I mean by fundamental causes and how I regard the usually attributed causes as only adjuvant. You will see also why I believe the problem is deeper than the individual and strikes at once at the social conditions brought about by the various industries and occupations.

I might speak of other conditions, but these two are sufficiently illustrative. Hysteria surely, and in all probability neurasthenia, belong to the class of diseases which are not dependent upon the introduction or the action upon the body of some specific morbific agent. They are essentially social diseases which depend for their existence upon the maladjustment of the individual to his social surroundings, his inability to fit into the demands that are made upon him because of his relations to other people, actually or prospectively, and as such can not be dependent for their existence upon long hours of work or upon the character of that work. These considerations, however, do not make it any the less important that they be considered in connection with the various industries, nor does it make it obvious why there has been such an increase in the number of these diseases. A moment's reflection, however, I think will convince you if you accept my premises that their importance lies not in the fact of their association with any particular kind or character of work so far as the fatiguing qualities of that work may be concerned, but that they are expressions of causes that are much more widely operative, social causes which have invaded and changed the

social conditions under which the people live, and evidently changed those conditions disadvantageously so as to make possible the outcrop of these diseases. The investigators of the industrial conditions should realize this factor in the situation as exemplified by the presence of this class of diseases.

My plea, then, in this paper is for the recognition of what I have termed "social diseases," for a realization that the problem of the various industries, as that problem deals with the question of the health of the workers, is a broader problem than the problem of ordinary physical disease. It is a problem which touches the whole question of society, and which presents for consideration the neuroses and the psychoneuroses as indications of a disease which is not individual, but social. Here we have in this class of diseases a point of attack upon abnormal social conditions, and, by their study, some kind of idea may be had as to the best means of approaching the faulty social conditions of which they are the expression, and which may be incident to the industrial conditions under consideration.

The necessary temporal restrictions of such a paper as this make it impossible for me to illustrate what I mean, except perhaps very briefly. It has been shown by careful analysis of certain cases of the psychoneuroses that the disorder was dependent upon experiences in the early years of childhood—types of experiences which, in many instances, were dependent upon the general crowded condition in which the family were forced to live. It will be seen, therefore, in such a case, that the disorder from which the patient suffers leads directly back to social conditions, which social conditions may or may not be dependent upon industrial conditions. The psychoneuroses, therefore, may become a very good barometer of certain social states dependent upon industrial conditions, and, while I am perfectly aware that the social state of the worker has been investigated very fully, still I do not think that it has been appreciated that many of the specific manifestations of illness are outward indications of certain types of social conditions that are undesirable. It will be seen, therefore, that a correlation between the work of the psychiatrist and neurologist, and the social worker, is possible along these lines. My paper merely bespeaks a recognition of the advantages of this correlation, which I am sure, if they were pursued, would be seen to offer many possibilities for work.

THE SUPPRESSION OF UNNECESSARY NOISE.

CLARENCE JOHN BLAKE, M. D., professor of otology, Harvard University, Cambridge, Mass., president Ninth International Otological Congress.

That the question of the suppression of noise should have reached its present degree of public consideration is due both to an increase in the amount of noise incident to the development of the mechanical form of expression of human activities, and to a better appreciation of the deleterious effects upon the human organism of energy waste expressed in sound which reaches the brain through the afferent channel of the organ of hearing.

Individual protests against noises, stigmatized as unnecessary, general or community protests against industrial noises have, from time to time, been made and have, in many instances, resulted in an abolition or a modification of the objectionable sound.

As examples of these may be cited the changes made in the lowering of pitch of Italian railway whistles and the limitation of the duration of signals, similar changes controlling the use of marine whistles on the waters surrounding the city of New York, the prohibition of the use of locomotive whistles for purposes of private signaling on some of the American railways, the prevention of factory-bell ringing at early hours, and the substitution of a less public summons to the day's work, the control of the noises of street traffic in the neighborhood of schools and hospitals in large community centers, and the efforts made, in response to the representations of operatives, in some manufacturing establishments, for the effective working not of a soundless but of a noiseless shop. All of these evidences of the appreciation of the existence of conditions prejudicial to comfort and to well-being, coupled with the plaints of members of the community abnormally sensitive to sound, have been progressively educative, and have prepared the way for a general recognition of the fact that the production of the irrelative and therefore inharmonious combination of sounds, to which we give the name of noise, is, in connection with any mechanical process, an evidence of a waste of energy which should go toward increasing the effectiveness of the machine; moreover, that this waste of mechanical energy, expressed in noise, entails a waste of energy on the part of the cooperating human machine, or, in other words, waste of mechanical energy expressed in noise means also a waste of human effectiveness.

It has long been known that continued exposure to loud noise results in degenerative changes in the sound-transmitting portion of the human ear, and that persons following noisy occupations, metal workers, jig sawyers, and factory operatives of various kinds, become in time subject to impairment of hearing, and present also objective changes in that portion of the sound-transmitting apparatus open to inspection through the external auditory canal.

These changes from the normal are mainly an indrawing of the drumhead and a generally distributed capacity of what is normally a semitransparent membranous structure.

Normally the drumhead, viewed from without, presents a generally concaved surface, the concavity being due to a depression of its central portion incident to the attachment of the membrane to the first bone of the ossicular chain, the malleus, and the pull inward of the tensor tympani muscle thereto attached.

Under the influence of the changes incident to continued exposure to loud sounds, the drumhead becomes more concave, because of the increased contraction of the tensor tympani muscle, and more or less opaque, because of the thickening of the mucous membrane lining the middle ear and forming the inner coat of the drumhead.

Both of these changes are the result of an effort at protection of the deeper-seated and more delicate sound-transmitting apparatus of the internal ear; the contraction of the tensor tympani muscle hindering the movement of the drumhead, as a whole, and the thickening of the mucous coat decreasing the segmental vibration.

The movement of the sound-transmitting apparatus of the middle ear, in response to the impact of sound waves entering through the external auditory canal, is to be regarded as grossly molar when compared with the incident movement of the sound-transmitting apparatus in the internal ear, where the motion is finally transferred to the nucleate cells receiving the terminal fibers of the auditory nerve, where the motion is transformed from molar to molecular.

The transmission of sound waves to the internal ear takes place, not only through the channel of the sound-transmitting apparatus of the middle ear, but also through the body, as a whole, and less through the medium of the soft tissues than through the skeletal structure, wherein its transmission is hindered by the interposition of such sound breaks as joints and sutures, and is most direct when the sound source is directly applied to the bone in which is incased the bony capsule of the internal ear.

It follows, therefore, that an individual working daily in a mechanically created noise, often accompanied by mechanically created vibratory action, is subject to changes in the auditory apparatus prejudicial to the continuance of its function, and that the continuance of this state of affairs is productive of waste of human effectiveness.

Until recently the objective evidence of these changes has been confined to their exhibition in the middle ear, but the earlier investigations of Moos and Steinbrügge into the pathology of the internal ear, incident to inflammatory and suppurative processes, have now been paralleled by the study of degenerative intralabyrinthine changes incident to such causes as that with which this communication deals.

Notable among these contributions have been those of Siebenmann, who demonstrated at the recent meeting of the Ninth International Otological Congress the cochlear lesions of a degenerative character consequent upon prolonged occupational exposure to loud noise, and also those immediate lesions incident to exposure to a loud sound with major force value and of sudden impact.

This scientific evidence, in the line of effect from recognized cause, serves to emphasize the justifiability of concerted action in the direction of further investigation as to consequences and further study as to means and methods by which an objectionable and growing factor in modern life may be suppressed.

The effect upon the organ of hearing is only a small part of the argument in favor of the suppression of unnecessary noise, the effect upon the nervous system as a whole, especially in those whose power of resistance or of compensation has been decreased by fatigue or by illness, must be considered, and in the well and mentally active the inroad upon the attempted continuity of a mental process resulting from the environment of an irregular, inharmonious, and penetrating sound have to be reckoned with in the estimate of the desirability of a general recognition of an offense which should be as little tolerated as any other unhygienic condition.

The fatigue element, in the effort at mental elimination of an intrusive sound, even though the effort has come to be almost subconsciously exercised, may be justifiably reckoned with in the estimation of the causes of the so-called nervous overstrain, while the increase of inventive endeavor toward the elimination of noise in the mechanisms most in daily use are illustrations of the growing appreciation of the now scientifically demonstrated truth.

In the case of subjection for a prolonged period to a very intense sound of high pitch, it has been found that the lower portion of the membranous cochlea, that portion devoted to perception of tones of high pitch, has undergone the most degenerative change, and the proximity of this portion of the cochlear tube to the vestibule and to the organ of equilibration suggests something more peripheral than the central organ, with its multiplex lines of reflex communication, as the possible source of the vertigo which sometimes accompanies the auditory discomfort incident to long exposure to continuous tones of high pitch.

In the presence, therefore, of accumulative evidence of the unhygienic character of noises, beyond the limit of requirements of public welfare and safety, in view of the growing volume of noise incident to the increase in traffic and in manufacture, and to the extension of the various public-service utilities, and based upon the scientific testimony to the actuality of the objectionable effects of noise upon the human economy, and the constitution thereby of another form of

human waste, the discussion of this subject should be upon the program of every conference upon the subject of hygiene and sanitation. It should be dealt with, in some form or other, from the human side, in every international otological congress, and it should be a permanent part of the purpose of existence of an institute of otologic research which, it is hoped, may some time be founded both for the solution of the increasing number of otologic problems and as a bureau for the dissemination of information upon such acoustic questions as may have become matters of public concern. The establishment of such an institute, especially in connection with one of our larger universities, would constitute a contribution of inestimable value to public uses in the particular form of scientific research which has to do with the study of the production of sound, its transmission and its control.

EXISTING LEGAL PROVISIONS WITH REGARD TO THE SUPPRESSION OF UNNECESSARY NOISES.

STOUGHTON BELL (A. B., L. L. B.), Boston, Mass.

I find no general statute covering the suppression of unnecessary noise. In many States particular noises are prohibited by statute, as, for instance, the cutting out of mufflers on automobiles and the muffling of the exhausts of motor boats. In Massachusetts local boards of health are given authority by statute to pass regulations to prevent noises that are dangerous to the public health. These regulations may apply to noises made within certain parts of the town or city, or they may be general in character and apply to the whole town, as in the town of Plymouth, where the making of unnecessary noises by the exhausts of motor boats has been prohibited. There is a statute in Massachusetts which provides that exhausts of motor boats shall be muffled in a reasonable manner, but this was considered difficult of enforcement, and the board of health in that town believed it to be necessary to pass a regulation which should be more definite in character. In Massachusetts the railroad commission can prevent the blowing of whistles and the ringing of bells on steam engines when they are disturbing to the inhabitants at a particular crossing, or in a particular village. No authority, however, is given to the railroad commissoiners to pass any general regulation with regard to these, and it is only after a hearing that they can prevent them in a particular locality.

In the absence of statute, or of regulation passed under authority of the statute, noises may be abated because they constitute a nuisance. In Blackstone we find that "a nuisance (nocumentum) or annoyance, signifies anything that worketh hurt, inconvenience, or damage," and "whatsoever unlawfully annoys or does damage to another."

A nuisance may be either public or private. If it be a public nuisance, it is a loud noise disturbing a neighborhood. If it be a private nuisance, it is a loud noise resulting in depreciation in the value of, or in damage to, property.

There are no fixed limits which govern either public or private nuisances. Each case must be judged by itself. The purpose for which the noise is made, the character of the noise, the place where it is made, and the time of making, must all be taken into consideration. It might well be that a person who owned a dwelling house in a strictly residential neighborhood might be enjoined from conducting therein a tinsmith shop, while that same person could not be enjoined, were he to make much more noise tearing down and rebuilding his dwelling house. In the one case, the noise would not be reasonable for that locality, and, in the other, the only reasonable use of the land must permit the tearing down and rebuilding of the structure and the noise attendant therewith. But even the noise of tearing down and rebuilding might be enjoined, if it were carried on at night, and if it were found that work at night was not necessary.

The care with which each case must be considered can best be illustrated by an examination of a case of private nuisance recently decided in our Massachusetts court, which had to do with the suppression of noises made by dredgers and tugs used in building the new Cape Cod Canal. The case was referred by the court to a master to find the facts and report thereon. A brief statement thereof is as follows: It appeared that, in order to complete the work of dredging the canal, it was necessary to use three dredgers. A number of persons who had summer places in the near neighborhood were disturbed by the noise made, and claimed that the value of their property was depreciated as a result, and brought suit to have it enjoined. The master found that, owing to the lateness of the time of beginning the dredging at this particular point, it was necessary to dredge both night and day. He found that there were two kinds of dredgers in operation, one having an endless chain to which buckets were attached, which creaked and made a great deal of noise, and the other two of the usual scoop construction. He found that there was no unnecessary noise connected with any one of the three dredgers; that they were all operated as quietly as was consistent with good results; that the purpose for which the dredging was done was a necessary one; and that, when operated at night, the dredge having the endless chain was a nuisance, and would be a nuisance to these complainants if located in any part of the canal that was then being dredged; that another dredge when operated at night was a nuisance in the particular location where it was at that time. No one of the dredgers, when operated by day, was a nuisance in the particular

location where it was at that time; that the third, when operated at night, was sufficiently far away from those who were complaining, so that it did not constitute a nuisance.

In connection with these dredgers, it was necessary to use scows to carry the material which was taken from the canal to other points for dumping, and two tugs were used for this purpose. Complaint was made that there was an unreasonable noise made by the whistling of the tugs. The master found that under the national pilot laws some whistling was necessary when the tugs passed one another and when they approached the dredgers. He found that the amount of whistling which the tugs did in complying with this national law was unreasonable, and ordered that they should reduce the noise to the minimum required by it. It was complained that the noise made by the dredgers in whistling to the tugs to bring up empty scows and to take away those that were filled was a nuisance. The master found that this could be done as well by the use of signal lights, and ordered that all whistling for this purpose should be stopped. It was also complained that the dredgers used the whistles at night to wake the men, when they were ready for a shift in the gangs at work. The master found that this was unnecessary, and ordered it stopped.

He found, then, that the purpose of all this work was a proper one; that it was necessary that the work should be done by night as well as by day, and, in studying the character of the noises, he distinguished between the two kinds of dredgers, claiming that all three were proper dredgers to be used in the daytime: that one was an improper dredge to be used at night; that another was a proper dredge to be used at night, but that, in the particular place in which it was situated, it unreasonably disturbed those who were in proximity thereto, and, as I have already said, he distinguished generally between the night and the daytime in determining the question of whether or not the noise constituted a nuisance.

In every case, a noise will be enjoined only when it is shown to affect injuriously a person of ordinary sensibility, and not those who, because of their physical or mental condition, or other causes, are particularly susceptible, otherwise the question of whether or no one was committing a private nuisance would depend upon the state of health of the person affected, and a manufacturer might be committing a nuisance to-day merely because a particularly susceptible individual was in the neighborhood, while on the following day, or even the following moment in the day, if that particular person had left, he could continue his noisy business lawfully.

I have outlined above some of the general principles governing the regulation of noise. I have not attempted to go into all the details nor the questions of fact which would naturally arise were the

question of preventing a specific noise before me. I have not mentioned the law governing the case of noises made with malicious motive or for improper purpose.

In closing it may be well to say a word with regard to any suggestive preventive legislation which may be before you for consideration. It is important in drawing any new act to present to a legislative body to carefully consider all of the various phases of the subject to which I have made reference above. In Massachusetts we have a law which requires that the exhausts of motor boats shall be muffled in a reasonable manner. There is no one who can determine in advance exactly what "muffled in a reasonable manner" is, and each case must be determined on its own merits in accordance with the whim, may I say, of the particular judge before whom it is heard. This is unsatisfactory legislation; unsatisfactory to the prosecuting officer and unsatisfactory to the person against whom complaint is made. Were a definite distance fixed by statute beyond which no noise must be heard from the exhausts of motor boats it would be an easy matter to determine exactly whether or not a particular boat was complying with the law. Great care should be used to see to it that a statute shall be so framed that those who desire to comply with the law can, from its wording, determine exactly what is meant.

Another instance of preventive legislation of the same kind, but from another point of view, is that which was enacted in Massachusetts that requires that in a thickly settled part of a city or town no bell, horn, or other device for signaling shall be sounded on an automobile so as to make a harsh, objectionable, or unreasonable noise. The purpose of this statute was to provide a warning signal, or rather to prevent the unnecessary use of a warning signal in thickly settled districts. It should not, however, be so reduced that it is not a distinct and emphatic warning to those who are on the highway. Under this law, accidents decreased 30 per cent in one year in the country districts of the State, but in the cities they increased 18 per cent. The noise which is required to warn a pedestrian or the driver of a vehicle in a thickly congested district should be, in my opinion, a distinct warning signal. It should be short and sharp and should be no more than is necessary to save or protect the lives of those upon our streets; and this very sharp, short signal should not be prevented in the noisy localities, but it should be regulated so that it can be used only as a warning of danger. It will then mean something to those who use our streets.

I have referred to these two specific statutes in order to call your attention to the difficulties which may arise in connection with any proposed statute. I am not suggesting the necessity of additional statutory law. In the case of the Cape Cod Canal work the law on

the subject was adequate to stop this making of unnecessary noise. In any movement for additional legislation to suppress unnecessary noise the greatest care should, in my opinion, be used, else the law as framed will defeat its own purpose and public opinion will be aroused against it.

DISCUSSION.

Prof. JAMES J. PUTNAM, of Boston: The time has come when needless noises must be classified as common plagues, like flies, mosquitoes, rats, and dirt. In eliminating them we must decide what noises are unnecessary, and what complaints against noises are reasonable ones. Much has already been done toward the abolition of unnecessary noises. The work of Mrs. Isaac L. Rich in effecting a mitigation of the noises near the hospitals and along the river front in New York City, is well known; and, in Germany, they have gone so far in certain communities as to declare even private noises, such as piano playing at all hours, to be a public nuisance.

People are sensitive in different degrees to noises. The ability to fix the attention away from noises helps one to withstand them, and the gain of this ability is the important element in "getting used" to noisy sounds. But noises undoubtedly cause a subconscious strain of the attention, productive of fatigue, and the liability to this strain also varies greatly. Experiments dealing with this point have been made by Wundt, Mosso, and others, and many references of value are given by Miss Josephine C. Goldmark, in her book "Fatigue and Efficiency," published recently by the Sage Foundation.

On the other hand, noises are sometimes objected to, not so much or not only on their own account, but because they are felt to be unnecessary, or because they suggest unwelcome thoughts. Some noises of these sorts one may learn to disregard, as the noise of children at play, which is far less hard to bear if one puts oneself, in imagination, in their place, or fancies oneself playing with them, and the like.

In working to secure quieter environments, sacrifices must be required of some persons for the sake of others, and also a mutual forbearance must be shown. At present tradition has too strong a hold upon us. We are too ready to allow the ringing of church bells at any and every hour and permit the sunrise of every public holiday to be greeted by a vast tumult of noises, whether people who will hear them may be sick or well. There is no sense in our adhering to such customs. Where a reasonable number of people request the removal of noises that can be easily removed the burden of proof should lie with the opponents; and the fact that the latter do not mind the noises objected to should not count too strongly for them. The modern man is a more sensitive being than his prehistoric, or even more recent, ancestors, and also more intelligent; and

while he should see that he uses his reason and increased power of self-control to prevent himself from making unreasonable demands, he may fairly insist, on his part, that he shall not be forced to endure any unnecessary strains.

STIMMHYGIENE, IHRE BEDEUTUNG UND IHRE ORGANISATION IN PREUSSEN (DEUTSCHLAND).

Prof. Dr. Th. S. Flatau, Leiter der phonetischen Abteilung bei der Kgl. Universitäts Ohren- und Nasenklinik, Berlin, Germany.

Meine verehrten Anwesenden: Wenn es auch seit langer Zeit bekannt ist, dass mit dem Verlust der Stimme Berufsstörungen verbunden sind, so ist die hervorragende Bedeutung dieses Zusammenhanges doch erst deutlich geworden seitdem die laryngologische Wissenschaft diesen Funktionsstörungen von der Seite der klinischen Pathologie her nahe gekommen ist. In Preussen and zum Teil auch schon in den anderen Staaten Deutschlands hat sich im Verfolg dieser Beobachtungen, an denen ich wohl zuerst und wesentlich im Sinne der exakten Diagnostik und Therapie und ebenso für die präventive Organisation teilnehmen durfte, zu einer Reihe von Einrichtungen und grundsätzlichen Anschauungen geführt, die ich in dieser Versammlung in kurzer Form niederlegen und zur öffentlichen Diskussion stellen möchte.

LEITSÄTZE.

The hygiene of the voice is an important part of physiological and professional hygiene.

There are professions based on the use of the voice in which the free and perfect use of the vocal organs is an essential condition of the social existence. In the artists' professions even the small irregularities bring danger.

(2) The principal types of the vocal professions are according to the different modes of function: The art of singing, the art of speaking (recitation), the voice of command (in the army or the school).

(3) Each of these forms of coordination can be disturbed without affecting the other.

(4) One gets an idea of the immense increase of disturbances due to the use of the voice in professional work by hearing that the most common functional disturbance of that kind, namely, the phonasthenia of singers (the dysodia), occurs in about 80 per cent of that profession.

(5) In consequence a great many individual existences break down, and great social, mental, and financial sacrifices are brought about in vain.

(6) In Berlin and its suburbs one can count about 80,000 to 100,000 professional singers, teachers, and other persons in the army or in the schools who use professionally the commanding voice.

Among these about 60,000 suffer from functional disturbances of the voice.

Quite similar is the case with preachers, actors, members of parliaments, and other political speakers.

(7) In consideration of the phonasthenia, of which I published in 1906 a monograph containing a systematic description of 100 clinical cases, it could be proved that the former methods of the laryngological examination alone were insufficient.

(8) Besides the old methods, there are new methods, invented by utilizing the acoustic and the other physical control of the function. Corresponding to that progress in diagnosis are also found new therapeutical measures, especially the electromechanical method of diagnosis and treatment, which I introduced some years ago.

(9) The essential cause of professional vocal trouble is the qualitative and the quantitative misuse of that organ.

(10) Extended examinations have proved that even in school the foundations of vocal troubles can be laid through a misunderstanding in the technical fundamentals of the development and adjustment of the voice.

(11) For the prevention of this prominent and increasing professional disease, special organized medical and pedagogical arrangements are necessary.

(12) A good many have already been established by the Prussian ministry of education.

(13) The prophylaxis is based on: Scientific and systematic lectures, with practical exercises for teachers in public schools and colleges; physiology of the voice. The training of the teachers in hygiene now takes two years. At the end of that "biennium" the students have to undertake a State examination. The students (teachers) are gradually drafted to those lectures from all the different parts of the Prussian Provinces.

(14) I can assure you that the above-mentioned measures have proved to be practical and successful, and we dare hope that the hygienic education of the singing teachers is organized in the same methodical way.

(15) Special medical arrangements have been made for the phonetical treatment of all the different forms of vocal troubles, first at the Royal University, at clinical institutes for ear and nose diseases at the Charity Hospital in Berlin, and since that, following this example, at other universities as well.

(16) In these departments all the different branches of phonetical therapeutic methods are studied and carried out, for the benefit of all those persons suffering from vocal troubles who are unable to afford private treatment.

TUESDAY MORNING, SEPTEMBER 24, 1912.

DIE BESCHÄFTIGUNGSNEUROSEN.

Prof. Dr. L. v. Frankl-Hochwart, Wien.

Unter Beschäftigungskrampf verstehen wir eine Innervationsstörung der Muskulatur, welche sich nur bei einer bestimmten komplizierten, durch Uebung erworbenen Tätigkeit derselben einstellt, während die Muskeln bei jeder anderen Aktion dem Willen gehorchen (Oppenheim).

Bell scheint zuerst die Aufmerksamkeit auf hiehergehörige Fälle gelenkt zu haben; später wurde die Schreibstörung, die bestbekannte, hiehergehörige Neurose von Brück in Jahre 1831 und Gierl im Jahre 1832 genauer studiert; bald folgten Alberth und Hayfelder. Erst in den 50iger Jahren kam man zur Kenntnis ähnlicher Neurosen bei anderen Beschäftigungen. Ein genaueres Wissen verdanken wir jedoch erst dem Eingreifen von Duchenne de Boulogne (1860) und Benedikt (1874). Letzterer Autor prägte den Ausdruck "coordinatorische Beschäftigungsneurosen" und unterschied (1) die spastische Form, (2) die paralytische, (3) die tremorartige; spätere Autoren (Gowers, Oppenheim u. a.) fügten noch (4) die neuralgische Gruppe hinzu. Unter den neueren Autoren, welche sich dem Studium dieser Affektion besonders widmeten, nennen wir: Bernhardt, Oppenheim, Onimus, Macé de Lepiné, Gowers, Remak jun., Dana, Ramsay, Hunt, t. Williams.

Es ist selbstverständlich, dass anfangs zur Zeit der allmählichen Entwicklung der Neurologie gar manche Zustände unter dem gemeinsamen Namen zusammengeworfen wurden, die nicht alle zusammen gehörten. Ich erinnere da an die irrtümliche Einreihung der Tetanie, ferner mancher cerebraler oder cerebrospinaler Zustände, an die Verwechslung mit Neuritiden—eine Verwechslung, die sich heute noch manchmal in der Literatur geltend macht.

Es soll nun systematisch versucht werden alle die Zustände zu skizzieren, die differentialdiagnostisch in Betracht kommen. Wir wollen der Reihe nach besprechen: (1) Die organischen Cerebralerkrankungen, resp. Cerebrospinalerkrankungen (Tabes, Paralyse, Sklerosis multiplex, etc.); (2) die "Tremores;" (3) Tic, Chorea; (4) Neurasthenie, neurasthenische Brachialgie, Hysterie, Angstzustände; (5) die Vergiftungen; (6) die professionelle Neuritis und

deren Entstehung (*a*) in paralytischer Form durch Kompressionen und Ueberanstrengung, (*b*) in neuralgischer Form, (*c*) in Form von Beschäftigungskrämpfen auf peripherer Basis; (7) ist noch zu besprechen die Differentialdiagnose von den Angioneurosen, Akroparästhesien, von der Dysbasia angiosklerotika und (8) die Differentialdiagnose bezüglich der Lokalerkrankungen (der Muskeln, Gelenke, Sehnen und Knochen—davon manche auf traumatischer Basis).

Unter den (1) Cerebralzuständen ist es die multiple Sklerose, die manchmal zu Irrtümern Anlass gibt; manchmal ergreift sie zuerst die rechte obere Extremität allein. Wenn ein solches Individuum, z. B., einen Schreibeberuf hat, wird sich die Störung natürlich besonders bei diesem Geschäfte geltend machen.

Es kommt auch vor, dass Paralytiker unter ähnlichen Verhältnissen anfangs als Beschäftigungsneurosen geführt werden; eine einigermassen eingehende Untersuchung wird natürlich den Irrtum sofort aufklären. Auch die Ataxie der cerebrospinalen Lues und der Tabes wird nur höchst oberflächlichen Aerzten eine Quelle von Irrtümern sein. Etwas anderes ist es bei der sich hier eventuell anzureihenden Paralysis agitans, die ja auch die Elemente des Spasmus, des Tremors und der Schmerzen in sich birgt, die ja erfahrungsgemäss an einer oberen Extremität einsetzen kann, die eventuell am meisten überanstrengt wurde. Der Kenner wird nicht lang im Zweifel bleiben; die Zustände treten bei näherer Beobachtung selbst im Beginne schon auch unabhängig von der Arbeit auf. Dazu kommt oft noch die permanente Steifigkeit der Muskeln, der sonderbare Gesichtsausdruck, die Hitzegefühle kurzum eine Reihe von Erscheinungen, die eine Verwechslung für die Dauer wohl ausschliessen.

Ueberhaupt geben die (2) Tremores am meisten zu denken, besonders dann, wenn das Zittern das einzige Symptom ist, wie beim sogenannten essentiellen Tremor, beim Tremor hereditarius und bei dem auf toxischer Basis; letzterer macht manchmal auch dadurch eine gewisse Schwierigkeit, weil manche Gifte (so namentlich Alkohol, Nikotin und vielleicht auch Blei) gewiss prädisponierend auf die Entstehung des Schreibkrampfes und anderer coordinatorischer Neurosen wirken. Die Differentialdiagnose wird dadurch erleichtert, dass bei den Tremores das Symptom sich bei den verschiedensten Beschäftigungen und nicht nur bei einer geltend macht. Dasselbe gilt auch bezüglich der Unterscheidung vom (3) Tic. Bisweilen treten die Choreaformen zuerst durch Schreibstörung in Erscheinung; bald wird sich aber dann erweisen, dass die Zuckungen sich auch unabhängig von der genannten Tätigkeit etablieren.

Wir haben so nun das Gebiet der Neurosen betreten, ohne dass wir bisher erhebliche Schwierigkeiten fanden. Nun kommt (4) aber die

Besprechung des Verhältnisses zur Neurasthenie und Hysterie—ein Verhältnis, das uns mehr zu denken geben wird. Die Schwierigkeit muss uns ja a priori klar werden; auch die uns interessierenden Kranken mit Beschäftigungskrämpfen leiden an einer Neurose; sie bieten einen fast negativen Befund, man kennt auch ihre Abhängigkeit von psychischen Faktoren, wir können auch bisweilen gemeinsame ätiologische Einflüsse, so z. B. nervöse Heredität, Erschöpfung, Ueberarbeitung, psychische Traumen, Intoxikationen, sowie auch die Beimengung verschiedener allgemeiner nervöser Symptome aufweisen. Es hat auch nicht an Bestrebungen gefehlt, diesen Knoten einfach zu durchhauen und direkt zu sagen, dass die Beschäftigungsneurosen einfach ein Symptom der Neurasthenie seien. Diesem Bestreben kann man sich aber nicht anschliessen, da es doch eine ganz erklekliche Anzahl von Fällen gibt, in denen keine eigentliche Allgemein-Neurasthenie zu diagnostizieren ist.

Wichtig ist es jedenfalls, gewisse Symptome der Neurasthenie zu kennen, die eine Beschäftigungsneurose vortäuschen können. Mehr als einmal glaubte ich beim Beginne einer Anamnese von Neurasthenikern die Geschichte einer Beschäftigungsneurose herauszuhören, bis mich das weitere Studium des Falles eines Besseren belehrte. Neurastheniker klagen so leicht über Schwere und Müdigkeit der Extremitäten; sie klagen auch gar nicht so selten über Schreibstörungen. Wenn man aber näher zuhört, so konstatiert man eher eine Art Unlust zum Schreiben, nicht selten auch neurasthenische Paragraphie. Es ist auch manchmal zu beobachten, dass sich die Schrift verändert, etwas zitterig—fahrig wird—dabei schreiben aber die Leute flüssig, eher überschnell; berufliche Störungen kommen auf diesem Wege kaum je zustande. Eher wird eine Schreibhemmung durch Verzögerung des Gedankenabflusses provoziert—ein Vorkommnis, das sich ja meist leicht klarstellen lässt. Auch der neurasthenische Tremor ist nicht schwer durch seine Unabhängigkeit von einer bestimmten Arbeit herauszukennen; er verändert übrigens die Schrift nicht merklich. Oft klagen auch nervöse Musiker—meistens sind es öffentlich auftretende—über ein Unvermögen zu singen oder zu spielen. In vielen Fällen bemerkt man, dass es sich nur um eine Art von Aengstlichkeit handelt; der Kenner bemerkt dann vielleicht eine Spur von Unsicherheit, ein minimales Dystonieren; wirkliche Störungen, wie bei den echten Beschäftigungsneurosen, kommen dann nicht zur Beobachtung. Gerade hier muss man die reinen Angstzustände und die sich damit etwa verbindenden Zwangsvorstellungen sorgfältig nach Möglichkeit abzutrennen suchen, was nicht immer ganz leicht ist, da die Leute mit den Beschäftigungsneurosen nicht allzu selten beim Auftreten der Störung auch Angstzustände haben. Man muss zugeben, dass es da Uebergangsformen gibt, deren Einrei-

hung unter Umständen strittig sein kann. Ueber eine eigentümliche Provenienz dieses Pseudoschreibkrampfes berichtete mir einmal ein junges Mädchen: Sie pflegte einmal in Abwesenheit ihrer Schwester deren kleinen Sohn und schrieb ihr in dessen Namen unter Benützung seiner kindlichen Diktate täglich einen Brief. Nun erkrankte der Knabe an Masern—ein Umstand, welcher der Mutter geheimgehalten werden sollte. Infolgedessen musste meine Patientin die Kinderbriefe auf Grund ihrer eigenen Phantasie produzieren; immer hatte sie dabei die Angst, dass sie unwillkürlich doch etwas von dem kleinen Unglück einfliessen lassen könnte. Nach und nach kam aber zu dieser Befürchtung noch Angst vor Briefen überhaupt, dann auch vor dem Schreiben, besonders bei gewissen Buchstaben.

Die Angst als Begleiterscheinung der Zwangsvorstellung bei gewissen Buchstaben und Zahlen könnte überhaupt einmal einen unerfahrenen Untersucher irrtümlich auf die Idee einer etwa vorhandenen Beschäftigungsneurose bringen. Ein interessantes hiehergehöriges Beispiel bieten auch die Neurosen der Barbiere: Dieselben leiden bisweilen an einer noch zu besprechenden Beschäftigungsneurose (Keirospasmus Oppenheim); davon ist wohl die von Oppenheim und auch von mir beobachtete Keirophobie zu trennen—der eigentümliche Angstzustand, der sich bei den genannten Leuten bei jedem Rasierversuch einstellt. Hier muss auch noch der Brachialgien gedacht werden, jener Pseudoneuralgien, wie sie im Verlaufe der Neurasthenie nach Oppenheim ziemlich häufig sind. Sie unterscheiden sich aber von den echten Beschäftigungsneurosen dadurch, dass sie auch unabhängig von jeder Arbeit auftreten.

Aehnlich gestaltet sich auch (5) die Differentialdiagnose von den toxischen Zuständen.

Nun kommen wir aber zum schwierigsten Kapitel (6) zur Abgrenzung von der professionellen Neuritis. Sie hat ja auch die Eigenheit, bei Leuten aufzutreten, die sich professionell überanstrengen und die jeweilig überanstrengte Extremität zu befallen; es ist ja auch klar, dass die jeweiligen Störungen bei der eigentlichen professionellen Beschäftigung besonders in den Vordergrund treten müssen. Wenn wir nun daran gehen die professionellen Neuritiden und ihre Differentialdiagnose zu studieren, so haben wir zum Teil ganz klare Fälle vor uns: Wenn wir direkte Lähmungen, Muskelatrophien, ausgesprochene elektrische Veränderungen, individualisierte Anaesthesien beobachten, so werden wir kaum schwanken. In manchen symptomenarmen Fällen können allerdings bisweilen Zweifel auftauchen. Bezüglich der Verwertung älterer Krankengeschichten der Literatur steigen die Schwierigkeiten, wenn die Befunde nicht ganz genau sind. Bei manchen dieser Krankheitsformen, die ich nicht selbst beobachtete und die ich nur aus der Literatur übernehmen muss, kann ich die Einreihung nicht immer mit voller Sicher-

heit machen. Ich halte es übrigens für denkbar, dass Uebergangsformen, resp. Kombinationen vorkommen. Ich kann mir denken, dass unter Umständen geringe neuritische Beschwerde Mitveranlassung zur Entstehung von wirklichen Beschäftigungsneurosen geben können—ähnlich wie wir Veränderungen an Sehnen, Knochen, Muskeln auch als hiehergehörige " agents provocateurs " ansehen.

Die Beschäftigungen, die zu echten Neuritiden führen können, sind sehr zahlreich. Ich verweise hier namentlich auf die Studien vom Macé und die ausführliche Darstellung von E. Remak, der ich nun zum Teile folgen werde.

Die Leute, die unter diesen Verhältnissen erkranken, sind zuweilen sehr gesunde kräftige Menschen; öfters konstatiert man aber eine gewisse nervöse Veranlagung, nicht selten Anämie, Alkoholismus, Nikotinismus. Wenn man schwerere Vergiftungen letzterer Art nachweisen kann oder ausgesprochene gewerbliche Vergiftung, z. B., mit Blei oder wenn Lues vorhanden ist, wird man allerdings der Beschäftigung nur die Rolle eines auslösenden Momentes zuschreiben können.

Nun mögen Beispiele von derartigen Neuritiden folgen, die auf Ueberanstrengung oder Kompression, bisweilen auch auf beiden beruhen. Gar nicht so selten findet man Atrophien der kleinen Handmuskeln: So sah Remak bei Plätterinnen schleichende degenerative Atrophie des Daumenballens und auch des vom Ulnaris versorgten Musculus interosseus primus und des Adductor pollicis, besonders links. So berichtet Cassirer ähnliches von einer Arbeiterin, welche in einer Posamentfabrik beschäftigt war; sie muste einen runden Holzpflock fest in der Handfläche eingedrückt halten und ihn dann kräftig umspannen; diese Arbeit musste sie durch acht Jahre täglich zwölf Stunden durchführen. Aehnliches erwähnt C. bei Goldpolierrinnen, Tischlern, Schmieden, ferner bei einem Postdiener, der sehr viele Briefe zu stempeln hatte, ferner auch bei Briefsortierern. Ich sah derartiges bei Graveuren, Cöster bei Zigarrenwicklern; Wertheim-Salomonson beschrieb Atrophie der kleinen Handmuskeln bei Diamantschneidern.

Eine leichte einseitige Ulnarisparese konnte ich bei einem Radfahrer beobachten; mir schien die Ursache in einem zu heftigen Umklammern des Gouvernals zu liegen. Simpson und Destot, welche diese Dinge zuerst beschrieben, glaubter eine Kompression des Os pisiforme supponieren zu müssen. Ulnarisparesen sah ich auch bei einem Kellner, der jahrelang die Hände dadurch überanstrengte, dass er immer eine Anzahl von Bierkrügeln bei den Henkeln in einer Hand trug.

Ulnarisparesen mit Atrophie der kleinen Handmuskeln kommen auch dadurch zustande, dass sich die Arbeiter jahrelang mit dem Ellbogen aufstützen und so den Ulnaris zur Erkrankung bringen.

So sah ich einmal einen Drechsler, dessen rechte Hand so atrophisch war, dass ein Neurologe unheilbar-progressiven Muskelschwund diagnostizierte. Mir fiel aber auf, dass der Fall sonst symptomlos war (keine weiteren Atrophien, keine Sensibilitätsstörung, keine Reflexanomalien etc.). Als ich aber den Patienten um seine Arbeitsgewohnheiten befragte, berichtete er mir, das er seit Jahren so arbeite, dass er das Stemmeisen mit den Ellbogen halte. Ich stellte die Prognose günstig: tatsächlich trat nach längerer faradischer Behandlung Heilung ein. Einen ähnlichen Fall beschreibt Remak, vergleiche ferner die untersuchungen von L. Teleky.

Recht zahlreich sind auch die professionellen Lähmungen an den proximalen Muskeln der oberen Extremität, die ebenfalls teils durch Druck, teils durch Ueberanstrengung bedingt werden. Ein vielzitiertes Paradigma ist die von Bachon beschriebene doppelseitige Radialislähmung der Wasserträger von Rennes, welche eiserne Henkelkrüge mittels des durch den Henkel durchgesteckten Seiles trugen, welches Seil die Oberarme oben drückte. Einmal sah ich bei einem Manne, der in ähnlicher Weise schwere Pakete trug, plötzlich rechtsseitige Radialislähmung auftreten; ähnliche Beobachtungen machten Weber, E. Remak. Bernhardt erwähnt eines Mattirers von Hornknöpfen, der seine Arme durch die runden Ausschnitte eines Kastens zu stecken hatte und allmählich Lähmung aller Armmuskel mit Ausnahme des Deltoides akquirierte. E. Remak beobachtete bei einem Schiffer, der vom Ufer aus gegen einen Kahn ein 6 Meter langes schweres Ruder mittelst der Schulter stemmte, Druckparese des Ulnaris-Radialis-Gebietes. Mehrminder vollständige Plexuslähmungen kommen bei den sogenannten "Kraxenträgern," bei Trägern von Kohlen, Bäumen, Tornistern, schweren Paketen zur Beobachtung.

Viel besprochen ist die die langen Daumenmuskeln betreffende Trommlerlähmung (Nürnberger, von Zander, Bruns). Allerdings sollen bei diesen Leuten auch manchmal Sehnenrisse vorkommen. Merkwürdig sind die plötzlich auftretenden Radialislähmungen bei habitueller grosser Ueberanstrengung des rechten Armes: Ich sah ein derartiges Vorkommnis je einmal bei einem Schmied und bei einem Holzspalter. Gouillain-Courtellement erblickte die Ursache einer partiellen Radialislähmung in einer berufsmässigen Ueberanstrengung durch Taktieren. Aehnliche Paralyse sah Oppenheim bei einem Weber, Féré bei einem Angler.

Leichtere Arbeitsparesen, namentlich im Medianus-Ulnarisgebiet werden besonders bei Formern, Schlossern, Schneidern, Möbelpackern, Bauarbeitern, Steindruckern, Glasarbeitern, Xylographen; Metallbohrern, Gürtlern beschrieben. Bei Kuhmelkern, deren echte Beschäftigungsneurose weiter unten erwähnt werden soll, finden sich auch nach langdauernder Ueberarbeitung Medianus-Ulnarisparesen.

Für die Differentialdiagnose ist auch die Tatsache wichtig, dass Gowers ganz vereinzelte Fälle von Schreiblähmung mit Sensibilitätsstörung im Bereiche des Medianus und Ulnaris erwähnt, Moebius Lähmung und Atrophie der Beuger des rechten Daumens. Bei einer ganzen Anzahl von Berufen ist auch das Auftreten von Serratus-Lähmung nach Ueberanstrengung bisweilen mit, bisweilen ohne Kompression des Plexus beschrieben worden: so bei Schustern, Anstreichern, Schmieden, Tischlern, Seilern, Feldarbeitern, Hutmachern.

Viel seltener sind die professionellen Lähmungen und Neuritiden an den unteren Extremitäten; sie sind meist Drucklähmungen durch Arbeit im kniehockender Stellung. Derartige Erkrankungen wurden zuerst von Zenker und Roth bei Kartoffelarbeitern und Arbeiterinnen beschrieben; sie betreffen zumeist die Peronealgruppe. Eine ganze Reihe von Leuten, die in der angegebenen Weise arbeiten müssen, können ähnlichen Affektionen unterliegen; so z. B. Steinsetzer, Asphaltarbeiter, Tischler beim Abhobeln der Fussböden, Rübenversetzer, Steinklopfer. Ab und zu wird auch über Fälle berichtet, in denen Paresen, eventuell Atrophien der Beine durch Ueberanstrengung entstanden, ohne dass eine kompressive Beeinflussung statt hatte; so bei Nähmaschinentretern, so bei einem Mann, der eine Pauke vermittelst Treten eines Pedals spielte, etc.

Viele der beschriebenen Affektionen verbinden sich, wie bekannt, mit Schmerzen, welche den Paresen und Atrophien vorausgehen, resp. sie begleiten. Viel häufiger sind rein neuralgische Zustände, die dann als objektives Symptom höchstens Druckempfindlichkeit der Nervenstämme aufweisen, daneben leichtere Hypästhesien, bisweilen ausgesprochene Anästhesien, die manchmal die ganze Extremität ergreifen, manchmal nur bestimmten Nervenverbreitungen folgen. Ich glaube, dass es keine schwerere professionelle Arbeit gibt, bei der nicht gelegentlich (6c) das Auftreten neuralgischer Störungen beobachtet wurde. In meinem Krankenprotokoll finden sich nicht wenig derartige Beobachtungen. Remak stellt eine ganze Reihe davon zusammen, so z. B. Schmiede, Gürtler, Zimmerleute, bügelnde Schneider, Wäscherinnen, Zigarrenwikler, Handarbeiterinnen (Häkeln, Nähen, Stricken, Wäschezuschneiden, Bügeln, Spulen), bei Tischlern (Hobeln), Kurbeldrehern, Schlossern, Webern, etc. Ein Gewerbechemiker Remaks, welcher bei der Rübenzuckeruntersuchung etwa 500 Mal täglich drei Monate lang einen Quetschhahn mittels der ersten Finger der rechten Hand zusammengedrückt hatte, hatte eine Medianus-Neuralgie davongetragen, welche das Schreiben hinderte.

Eine Aufzählung aller hiehergehörigen Möglichkeiten hat wohl keinen Zweck. Ich will nur einige noch besonders erwähnen, die

dadurch interessant sind, weil sie zu differential-diagnostischen Bemerkungen Anlass geben: Es ist z. B. sicher, dass bei Leuten, die sich beim Schreiben sehr überanstrengen, Armneuralgien auftreten, die sich dann auch unabhängig von der Beschäftigung geltend machen. Vieles, was auch als coordinatorischer Musikerbeschäftigungskrampf gilt, ist gewiss besser hier einzureihen. Niemand wird bezweifeln, dass bei den Musikern echte Beschäftigungsneurosen vorkommen; aber sie sind vielleicht seltener als die hier beschriebenen Neuralgien. Sehr überzeugend sind da die sorgfältigen Studien Zabludowskis bei den Pianospielern. Namentlich scheint bei den jugendlichen Spielern häufig eine Störung aufzutreten. die mit einer Neurose gewiss nichts gemein hat; in den meisten Fällen habe man es nach Z. mit einer Distorsion mit oder ohne Erguss oder mit einer Myositis zu tun. Die Erkrankung entsteht meist dadurch, dass die Tasten für die Hand zu breit sind und dass oft zu weitgriffig geschriebene Kompositionen geübt werden. Allmählich entsteht auf diesem Wege die neuritische Entzündung, die mit heftigen Schmerzen und mit einer gewissen Schwäche einhergeht. In einem Falle beobachtete ich eine ausgesprochene Adduktionsparese des linken kleinen Fingers. Aehnliche Dinge sieht man allerdings seltener bei Spielern von Streichinstrumenten, noch seltener bei Bläsern; von den Erkrankungen der Trommelschläger haben wir bereits gesprochen.

Aehnlich verläuft auch eine für unsere Zeit ziemlich wichtige Beschäftigungskrankeit—die der Stenotypistinnen (Fälle bei Männern fand ich nicht beschrieben). Es handelt sich meist um junge anämische Mädchen, die nach der anstrengenden Arbeit anfangs Schmerzen in den Fingern bekommen, welche allmählich den Arm ergreifen.

Hier müssen noch die Telegraphisten erwähnt werden. bei denen allerdings auch später Beschäftigungsneurosen beschrieben werden. Diese Leute erkranken gar nicht selten an nervösen Leiden (Onimus, Cronbach): besonders sind es die Morse-Telegraphisten; doch sind die, welche sich mit dem Hughes-Apparat beschäftigen, nicht frei davon. Die ersten Symptome sind Schmerzen; oft treten keine weiteren Erscheinungen dazu, so dass die Einreihung in dieses Kapitel berechtigt erscheint. Bisweilen haben dieselben eine nicht näher zu charakterisierende Art, bisweilen werden sie als dumpf, bohrend, stechend, ziehend oder brennend empfunden; manchmal sind sie oberflächlich, manchmal tief, bisweilen scheinen sie dem Verlauf der Nerven zu folgen; Kälte- und Taubheitsempfindungen werden als Begleitsymptome erwähnt. In vorgerückteren Stadien kommt es allerdings auch zu Paresen—bisweilen zu heftigem Zittern, bisweilen zu klonisch-tonischen Krämpfen; hier und da entwickeln sich leichte Atrophieen.

Dass auch professionelle Uebermüdung der Beine Zittern, Schwäche, neuralgische Schmerzen erzeugen kann, ist ja allgemein bekannt. Vielleicht gehört hieher der zuerst von B Schulz beschriebene Tänzerinnenkrampf: die eigentümliche Erscheinung, dass Berufstänzerinnen beim Ausführen des Spitzenpas schmerzhafte Wadenkrämpfe bekommen (diese Form wurde auch vielfach unter die Beschäftigungsneurosen gerechnet).

Es ist vielleicht nicht uninteressant daran zu erinnern, dass Zahnärzte öfters Neuralgien in den überanstrengten Händen bekommen.

(6d) Oben haben wir schon der lokalisierten Krämpfe gedacht, die sich von den eigentlichen Beschäftigungskrämpfen dadurch unterscheiden, dass sie anfangs in einem gewissen Zusammenhang mit der Arbeit auftreten, später sich aber auch unabhängig davon geltend machen. Remak fasst diese Gruppe unter dem vielleicht nicht ganz glücklichen Namen der "Beschäftigungskrämpfe auf peripherischer Basi" zusammen. Er beobachtete derartiges bei einer Kuhmelkerin und einem Zeitungsfalzer; G. Köster erwähnt Aehnliches bei Schneidern, Schuhmachern, Notenstechern.

(7) Sicher besteht zwischen professionellen Neuritiden, coordinatorischen Beschäftigungsneurosen und den sogenannten vasomotorischen Neurosen (Angioneurosen) eine gewisse Aehnlichkeit. Am ehesten könnten die Akroparästhesien wirklich zu Verwechslungen Anlass geben—nicht nur, weil das Symptomenbild einige Aehnlichkeit hat, sondern weil auch diese letztgenannte Krankheit so häufig bei einem bestimmten Berufe, bei den Wäscherinnen vorkommt. Aber der Umstand, dass die Schmerzen und Parästhesien nicht so sehr bei der Arbeit oder im unmittelbaren Anschluss an die Arbeit auftreten, sondern erst meist in der zweiten Hälfte der Nacht, ferner die meist auffallende weissliche oder bläulich-weissliche Verfärbung der Fingerspitzen weisen auf die richtige Spur. Ferner geben die Leute oft ganz bestimmt an, dass das Leiden durch Eintauchen der Hände in kaltes oder warmes Wasser bisweilen in günstigem oder ungünstigem Sinne beeinflusst wird. Ein weiteres diagnostisches Hilfsmittel bildet der Umstand, dass die Akroparästhesien zumeist bei Frauen auftreten und zwar sehr oft im Zusammenhange mit der Maternität (Gravidität, Menopause).

Hier schliesst sich eine Affektion an, die vielleicht einmal zu differentialdiagnostischen Bedenken Anlass geben kann; allerdings schützt schon die Seltenheit derselben einigermassen davor; ich meine das intermittierende Stottern der Brachialarterie (Dysbasia intermittens angliosklerotica). Langbekannt ist ja das intermittierende Hinken der Beine der Arteriosklerotiker: die bei längerem Gehen auftretende, von Schmerzen begleitete transitorische Gehstörung; als Begleitsymptom konstatieren wir gewöhnlich mit

Erb ein Fehlen des Pulsierens der Arteria dorsalis pedis. Eine allerdings seltene Analogie findet sich auch an anderen Arterien, so unter anderm auch an der Brachialis (Nothnagel, Kronenberg, Macé, Erb, Schlesinger, E. M. Williams u. A.). Auch bei dieser Affektion zeigen sich Parästhesien, Verfärbungen, krampfartige Schmerzen bei der Ausführung mancher Bewegungen; ein gewisser Einfluss psychischer momente ist nicht selten zu bemerken. Doch weist schon die allgemeine Arteriosklerose, noch mehr aber das Fahlen des Pulses der Armarterien, das Auftreten bei den verschiedensten Beschäftigungen bald auf die richtige Fährte.

Nachdem wir nun die eigentlichen (organischen und nichtorganischen) Nervenkrankheiten und die Gefässerkrankungen in ihrer Differentialdiagnose genug beleuchtet haben, so erübrigt es uns noch darauf hinzuweisen, dass auch durch lokale Muskelerkrankungen (Myositiden, Gelenk- und Sehnenerkrankungen) Störungen hervorgerufen werden können, die an Beschäftigungsneurosen erinnern: man vergesse auch nicht, dass durch Ueberanstrengung derartige lokale Veränderungen namentlich an den Sehnen mitprovoziert werden können. Es ist auch gewiss nicht zu selten, dass chronische Periostitiden Anlass zu Zuständen geben können, die an Beschäftigungsneurosen erinnern und sich auch durch Ueberanstrengung bei einer bestimmten Beschäftigung erklären lassen. Namentlich wurde man in neuerer Zeit auf die Erkrankung des Epicondylus aufmerksam, wie sie z. B. bei den Tennisspielern häufig beschrieben wurden; ähnliche Dinge sieht man natürlich auch nach Ueberanstrengung in anderen Berufen.

In den meisten Fällen wird die Unterscheidung ganz leicht sein, wenn man nur genügend genau untersucht; die Lokalerkrankungen machen ja gewöhnlich sehr sinnfällige Erscheinungen. Immerhin ist es möglich, dass geringe Veränderungen an Sehnen und Gelenken unter Umständen zu den mitprovozierenden Faktoren bei der Entstehung echter (eigentlich psychogener) Schreibkrämpfe gerechnet werden müssen (man vergleiche die Beobachtungen von Alois Pick u. a.) Man darf aber solche relativ geringfügige Nebenbefunde nicht überschätzen. Ihre Behandlung kann höchstens einen suggestiven Wert haben und darf nie mit Vernachlässigung der Allgemeintherapie einhergehen. Es ist ja auch klar, dass gröbere anatomische Veränderungen nach Traumen Schreibstörungen verursachen können, die unter Umständen bei oberflächlicher Betrachtung Schreibkrämpfe vortäuschen können; die Lokaluntersuchung wird bald Aufklärung bringen. Unter Umständen schuldigen die Leute oft geringe, bisweilen mit Schreck verbundene, Verletzungen als Ursache des sonst als psychogen imponierenden Zustandes an; das Ganze könnte dann vielleicht einmal dem Bilde einer traumatischen Neurose entsprechen. Ich muss aber diese genannte Konstellation wohl als selten ansehen;

ich habe unter ziemlich zahlreichen Beschäftigungsneurosen nie mit Bestimmtheit ein körperliches Trauma als mit veranlassendes Moment vorfinden können. Umgekehrt habe ich unter tausenden von traumatischen Neurosen nie einen Symptomenkomplex gesehen, der einer typischen coordinatorischen Beschäftigungsneurose entsprach.

Nachdem wir uns bemüht haben, die Differentialdiagnose möglichst klar zu stellen, ist es nun an der Zeit uns mit unserem Hauptthema—mit der Natur der coordinatorischen Beschäftigungsneurosen näher zu befassen. Ich glaube, dass es am besten ist, wenn wir zuerst den Schreibkrampf allein studieren, der ja die bekannteste Form darstellt. Mit Hülfe der dabei erworbenen Kenntnisse ist es leichter in das Verständnis der anderen hieher gehörigen Formen einzudringen.

Wenn wir die Leute mit der besprochenen Schreibstörung übersehen, so fällt es vorerst auf, dass nur Männer daran erkanken; unter meinen 41 Fällen war nur 11 weibliches Individuum. Das Gros der Fälle steht bei Beginn der Affektion zwischen dem 20. und 40. Jahr; zwischen dem 40. und 50. Jahr ist das Einsetzen nicht gerade häufig. Jenseits des 50. Jahres wird die Affektion immer seltner; vor dem 20. Jahr kommt sie nur vereinzelt vor. Unter meinen Fällen fand sich nur ein Mann unter zwanzig Jahren (17jähriger Handelsschüler).

Wederholt wurden in der Literatur Fälle von Beschäftigungsneurosen der Geldwechsler und Geldzähler beschrieben. Ich habe einmal einen zirka 60jähriger Bahnkassier beobachtet, der im übrigen ganz gesund war; nur beim Geldzählen bekam er Parästhesien, sowie gleichzeitig eine gewisse Schwerfälligkeit der Bewegung, so dass er seinen Beruf aufgeben musste. Auch für unsere modernsten Arbeiter, für die Chauffeure, weiss man schon von einer Neurose zu berichten. Macé erzählt von einem ihm von Dr. Siccard mitgeteilten Fall: Der Chaufeur bekam sofort beim ersten Versuch den Volant zu drehen, Krampf in der Hand, so dass er nicht imstande war das Fahrzeug zu lenken.

Eine andere Gruppe von den uns beschäftigenden Kranken bekommen die Affektion in den unteren Extremitäten: Hierher werden von vielen Autoren die Tänzerinnen-Krämpfe gerechnet (siehe oben). Mehrfach wurden Neurosen bei Leuten beobachtet, die ein Pedal zu treten haben oder die Drehung eines Rades mit dem rechten Bein betrieben (Drechsler, Scherenschleifer, Nähmaschinentreter, Silberarbeiter, Lohgärber, Lochbohrer, Weber, Byciclisten).

Wir haben schon bei Gelegenheit der Besprechung der Beschäftigungsneurosen der Bläser, Sänger und Sprecher gesehen, dass die uns beschäftigende Krankheit durchaus nicht an die Extremitäten gebunden ist. Wir finden Nackenkrämpfe bei "Lesern" erwähnt—bei Leuten, die sich durch Lektüre überanstrengt haben (Andrale,

Näcke); doch erinnern die beschriebenen Dinge mehr an einen "Torticollis mental" (Macé). Mehr in unser Gebiet gehörig scheint eine alte Beobachtung Duchenne's: Ein Student hatte sich bei der Vorbereitung zur Prüfungsarbeit sehr überanstrengt und begann nun an starken Schmerzen in den Schläfen, an der Stirne und an den Augen zu leiden. Beim Lesen bekam er Hyperämie des Gesichtes, Stirnmuskel- und Lidkrämpfe, die durch einige Jahre dauerten, aber immer nur bei der Lektüre auftraten; der junge Mann tötete sich aus Verzweiflung.

Wir finden auch einige Berichte, die von dem Vorkommen von Augenmuskelkrämpfen als Ausdruck einer Beschäftigungsneurose handeln; so kann nach Oppenheim nach anhaltenden Mikroskopieren, z. B., bei Fleischbeschauern beim Versuch dieser Tätigkeit ein Krampf im Akomodationsmuskel eintreten. T. Cohn erwähnt bei Uhrmachern Orbicularisкrampf; Tranjen beschreibt einen Exerzier-Augenmuskelkrampf, i. e., einen bei militärisch vorgeschriebenen Augeneinstellungen sich entwickelnden Krampf der entsprechenden Muskeln. Oppenheim meint, dass an dieser Stelle der Nystagnus der Bergleute einzureihen sei; eine ähnliche Störung sah der genannte Autor auch bei einer Violinistin, die gezwungen war berufsmässig Notenschrift von einem erhöhten Pult aus bei schlechter Beleuchtung abzulesen.

Die Prognose der Beschäftigungsneurosen ist keine gute Ein Umstand ist gewiss von bösem Einfluss; die Meisten der Betrofenen leben—oft recht mühsam—von der jeweiligen manuellen Beschäftigung und können sich daher keine Ruhe gönnen. Ja, im Gegenteil: Je mehr die Zustände zunehmen, umso länger müssen die vor ihrem Defekte behinderten Leute arbeiten, um ihr Pensum zu erledigen. Ich habe allerdings auch unter den wohlhabenderen Patienten die Prognose gar nicht viel besser gefunden; Rezidiven nach scheinbar gut gelungenen Kuren sind leider nicht selten. Damit will ich aber durchaus nicht die Unheitbarkeit aussprechen und nicht therapoutischen Nihilismus predigen. Die Krämpfe sind auch in ihrer Prognose nicht gleich: so waren meine therapeutischen Erfolge beim Schreibkrampf nicht immer gute; mehr befriedigend waren sie bei den Musikerkrämpfen; in letzterem Punkte machte auch Oppenheim ähnliche Erfahrungen (mündliche Mitteilung).

Von grosser Bedeutung ist die Prophylaxe: Wir sehenja, dass die Erkrankung meist die Disponierten trifft. Alles, was dzu beiträgt, die Rasse zu stärken und zu kräftigen, ist auch Schutzwar gegen die Beschäftigungsneurosen. Hygiene des Lebens, Mässigkit im Genuss von Alkohol und Nikotin sind notwendige Dinge. Wchtig scheint mir, dass Leute, die in einer bestimmten Richtung mnuell zu viel arbeiten, in ihren Freistunden Arbeiten anderer Naturmachen, z. B., Gymnastik, körperliche Spiele, Rudern, Schwimmen—vielleicht auch

kleine mechanische Arbeiten mit Beschäftigung anderer Muskelgruppen.

Die Besprechung der uns vorliegenden Neurosen birgt auch ein Mahnwort an die Lehrer. Die Erziehung zu einer guten Schreibhaltung ist eine ernsthafte Pflicht derselben; immer möge auf guten Lichteinfall geachtet werden, auf gute Schreibfedern, auf gutes Papier. Man verwende grosse Tintenfässer mit reichlichem Inhalt von dünnflüssiger, nicht zu lichter Tinte, man tauche nicht zu selten ein; das sind scheinbar kleinliche Regeln, die doch ihre ernste Bedeutung haben. Ebenso grosse Verpflichtungen müssen wir den Musikpädagogen auferlegen. Wir sehen die Neurosen gerade so oft bei den jungen Musikschülern, noch mehr bei den Schülerinnen, auftreten. Man überspanne die Kräfte der jungen Leute nicht; man vergesse nicht, wieviel Neuropathen gerade unter den musikalisch begabten Menschen sind. Es gibt entschieden Methoden, die besonders geeignet sind Neurosen herbeizuführen. Beherzigenswert ist der Vorschlag Zabludowskis Jugendklaviere mit verschmälerter Klaviatur zu konstruieren.

Was wir hier von Schreib- und Musikneurosen gesprochen haben, lässt sich mutatis mutandis auch für die andern Beschäftigungsneurosen anwenden.

Alle die prophylaktischen Massnahmen bedürfen aber auch der Einsicht der Arbeitsgeber, die eben darauf bedacht sein müssen, dass die Arbeitsanstrengung nicht zu grosse Dimensionen annehmen solle.

Wir, als praktische Aerzte, bekommen natürlich erst die schon entwickelten Fälle zur Begutachtung und zur Behandlung. Das Erste, was wir zu verordnen haben, ist Ruhe bezüglich der die Neurose provozierende Beschäftigung, wobei andere manuelle Tätigkeiten weiter gemacht werden können, ja sollen. Man behandle das ganze Individuum; man achte auf Arteriosklerose, Alkoholismus, Nikotinismus, man verordne Landluft, Gebirgsluft, See- und Sonnenbäder. Man gebe Nährpräparate, man versuche Eisen, Arsen, Kakodyl; im Ganzen hat man jedoch von inneren Mitteln nicht all zu viel zu erwarten.

Nicht gering mag die Hydro-(Thermo)-Therapie eingeschätzt werden, da sie auf das Allgemeinbefinden grossen Einfluss hat: Laue Halbbäder, Einpackungen, laue Douchen werden mit Erfolg verwendet. In neuerer Zeit wird ab und zu Heissluftbehandlung versucht. Unter den balneotherapeutischen Kuren scheint mir ein Versuch mit indifferenten Thermen berechtigt. In neuerer Zeit geht man daran Radium-Kuren (Bäder, Emanation) zu verwenden.

Seit Jahrzehnten geniesst die Elektrotherapie ein besonderes Vertrauen für die Behandlung der Beschäftigungsneurosen. Vielfach wurde Galvanisation empfohlen: Man verwende 30 cm Elektroden, Ströme von 4 M. A. und zwar entweder stabile Durchströmung oder

Katode an die Wirbelsäule, periphere Streichung mit der Anode. Auch Durchströmungen des Kopfes und der Wirbelsäule werden empfohlen. Weniger Wertschätzung fand die Farado-Therapie; in neuerer Zeit wurden noch Franklinisation, Arsonvalisation, sowie elektrische Bäder verwendet.

Vorsichtige Gymnastik hat ihren nicht geringen Vorteil, noch mehr aber eine geduldige rationelle Massage. Leichte Effleurage, Nervenvibrationen, passive Bewegungen, später Muskelknetungen werden von den Fachmännern empfohlen. Nur mit grosser Vorsicht geht man zu Widerstandsübungen über, zumeist zu solchen, welche der Gymnast selbst manuell gibt. Bum verwendet dazu kleine, mit Blei gefüllte Eimer, welche an die Finger gehängt werden. Man empfiehlt auch noch die Mechanotherapie mit Apparaten nach Herz und Zander.

Wir kommen nun zur Frage des Gebrauches von Schreibapparaten für die Hand. Die Patienten mit Schreibkrampf kommen oft von selbst auf die Verwendung dicker Federstiele; sie erzeugen sich auch solche wohl selbst, indem sie einen dicken Kork verwenden, durch den der Federstiel durchgesteckt wird. Die Industrie hat eine Reihe der verschiedensten ähnlichen Konstruktionen erzeugt. Wiederholt sah ich kugelförmige Federhalter verwendet; andere werden mit Ringen oder Oesen versehen, durch welche die Patienten ihre renitenten Finger stecken. Man gebraucht auch Verbände zur Fixierung des Handgelenkes, appliziert eventuell Holz- oder Metallschienen, um dasselbe in Streckstellung zu erhalten.

Viel Aufsehen hat seinerzeit das Nussbaum'sche Bracelet gemacht: Die Finger werden durch eine braceletartige Spange gesteckt, welche oben die mittelst einer Schraube befestigte Feder trägt; die genannten Finger werden in demselben ausgespreizt und gestreckt gehalten. Sobald die Flexoren in Funktion gesetzt werden, fällt das Bracelet von den Fingern herunter. Zabludowski empfiehlt einen nach verschiedenen Richtungen verstellbaren Federträger.

Eine sehr wichtige—vielleicht die wichtigste Art der Therapie—sind die Schreibübungen, die Reeducation. (Hier handelt es sich natürlich nicht um die Ersatzmittel, wie z. B. Schrieben mit der linken Hand, Verwendung der Schreibmaschine.) Die Leute lernen bei den eigentlichen Uebungen eben neue Assoziationsmechanismen: Gowers empfahl das Schreiben "aus der Schulter." Der Schreiblehrer Wolff hat ein ganzes, seinerzeit sehr bekannt gewordenes System ausgearbeitet. Viele wertvolle Vorschriften über die Angewöhnung des Schreibens grosser Buchstaben, über Aenderung der Körperhaltung, der Armhaltung, der Federführung findet man bei Zabludowski.

Eine kompliziertere Methode der Reeducation hat Kouindjy ausgebildet: Er beginnt mit den verschiedensten Uebungen mit

Münzen, kleinen Ballen, Stäben, die z. B. auf den Rücken der Finger gelegt werden, in die Höhe geworfen, von der Handfläche wieder aufgefangen werden. Nach genügender Vorübung lässt K. die Leute mit nach aufwärts gerichteter Handfläche schreiben. Aehnliche Methoden verwendet er für den Krampf der Violinisten, Pianisten, Telegraphisten. Meige rühmt Uebungen mit Spiegelschrift; er bezeichnet mit fünf kurzen Worten das Ideal des Schreibens der Kranken: Er schreibe "peu, lent, rond, gros, droit."

Wir haben jetzt allerdings wieder hauptsächlich die Therapie des Schreibkrampfes beschrieben. Aber jeder Arzt wird leicht die hier entwickelten Prinzipien auch auf die anderen Beschäftigungsneurosen übertragen. Eines gilt für alle diesbezüglichen Behandlungen: Wir wissen immer besser, dass die meisten der hieher gehörigen Affektionen psychogenen Ursprungs sind. (Man vergleiche da wieder die allerneuesten Untersuchungen von T. Williams.) Immer klarer wird uns, dass hier nur der Arzt helfen kann, welcher Talent, Liebe und Geduld zur Psychotherapie hat. Hier kommt es weniger auf den Scharfsinn der Methode an, als auf den Scharfsinn des Arztes.

Aehnlich wie bei den Schreibern treten auch bei den Malern und Zeichnern hie und da Beschäftigungsneurosen auf: Auch da wieder nicht bei den Künstlern, sondern bei denen, die gewerbsmässig monotone gleichförmige Arbeit möglichst rasch zu leisten haben. Man vergleiche z. B. die Beobachtung von Delthil bei einem Zeichner, der Uhrblätter mit Ziffern zu bemalen hatte. Auch bei Stenotypisten sollen neben den echten Neuralgien ab und zu Neurosen vorkommen.

Wir wollen uns nun zu einer zweiten Gruppe wenden, zu den Musiker-Beschäftigungsneurosen. Sie haben allerdings nicht die grosse soziale Bedeutung der Schreibkrämpfe; für den Neurologen hat die Sache aber ein grosses Interesse, weil die psychische Komponente viel klarer hervortritt. Hier haben wir gerade oft Berufskünstler vor uns, die unter dem Einfluss der gefürchteten Noxe "Publikum" stehen.

Das häufigst gespielte Musikinstrument—das Klavier—führt, wie ich glaube, eher zu den schon oben geschilderten Neuritiden; doch enthält die Literatur auch Angaben über echte spastisch-paralytische Formen; bisweilen wird auch die neuralgische, nicht neuritische Form beschrieben. Aehnliche Störungen wurden auch bei Harmonium-und Orgelspielern beobachtet.

Unter den Saiteninstrumenten sind es zunächst die Streichinstrumente, die uns interessieren: In erster Linie sind es die Violinspieler, auch bei diesen wieder mehr die Virtuosen als die Orchesterspieler. Der Grund mag teilweise in der Ueberarbeitung beim Ueben liegen;

zum Teil aber auch mit der Angstvorstellung des Versagens vor dem Publikum. Wir haben es einerseits mit den Störungen der linken Hand zu tun; andererseits aber auch manchmal mit den rechtsseitigen, mit den Defekten der Bogenführung. An der linken Hand sind es hauptsächlich Fingerbeugekrämpfe, welche das Spiel beeinträchtigen, ja oft unmöglich machen. Manchmal ist es eine Greifschwäche, manchmal liegt eine Nuance von Ataxie vor—eine gewisse Unsicherheit des Aufsetzens der Finger—lauter kleine Dinge, die aber der "Glockenreinheit" des Spieles abträglich sind. Bei Andern hört man wieder über Schwäche und Unsicherheit in der Bogenführung klagen, in anderen Darstellungen wird von Krämpfen in den Fingern und am Deltoides gesprochen, auch kommen Schmerzattaken als Behinderung des Spiels vor. Aehnliche Erscheinungen, wie bei den Geigenspielern, sah ich, gleich Cassirer, bei Cellisten.

Fingerbeschäftigungsneurosen werden auch bei Harfenspielern beschrieben, in seltenen Fällen kommt es auch bei diesen Leuten zur Unsicherheit oder zum Krampf im Beine beim Gebrauche des Pedales. Auch bei Zitherspielern kommen neben den schon erwähnten Neuritiden, wie ich mich selbst an einem Falle überzeugte, Neurosen vor; es handelte sich um Einziehen des rechten Daumens bei jedem Spielversuche.

Bei den Bläsern werden auch die verschiedensten Formen der Beschäftigungsneurose der Hände beobachtet: Ich sah derartiges bei einem Cornet- und einem Flötenbläser; in der Literatur finden sich ähnliche Vorkommnisse bei Klarinettisten, Oboisten, Posaunisten verzeichnet. Schmerzen, Unsicherheit, Schwächezustände werden beschrieben, aber auch Krämpfe sind öfters erwähnt; sie machen sich öfters dahin geltend, dass die Spieler an einer Klappe oder an einem Loche des Instrumentes durch Krampf wie fixiert bleiben; nur nach einiger Zeit gelingt es ihnen, den Finger wieder zu erheben—ein Umstand, der die Leute oft zum Aufgeben des Berufes zwingt. Bei Besprechung der Bläser-Neurosen muss man auch der merkwürdigen Lippen-Zungen-Störungen gedenken (Stadler, Oppenheim, Turner). Sie betreffen Bläser, die bei Versuchen den Ton zu bilden Krämpfe der genannten Muskelgruppen bekamen.

Hier reihen sich in gewisser Hinsicht die Stimmstörungen an. Gutzmann, dem wir nun folgen, teilt sie in drei Gruppen ein:

(*a*) In die Störungen der Sprechstimme, die sich in starker Ermüdung, in Zittern, in unterbrechungen (vox interrupta) und Aphonie geltend macht.

(*b*) Die Störungen der Kommandostimme, die sich als (1) starke Ermüdung mit Reizerscheinung geltend macht, (2) als Herabsetzung der Intensität in der Lage der Kommandostimme, (3) als komplete Aphonie in der Kommandostimmlage.

(c) Die Störungen der Singstimme: (1) Ermüdung mit Reiz, (2) Störungen der Intonation (die Töne werden nicht getroffen oder nicht in der gleichen Höhe gelten), (3) Störungen der Stimmstärke, (4) Störungen der Dauer, (5) Störungen des Klanges (Presston, Gaumenton, Kehlton, der hohle Ton, der verschleierte Ton, der hölzerne Klang, der hauchige Klang, etc.).

Nach Gutzmann entstehen diese Dinge zumeist auf funktioneller Grundlage und basieren auf einer durch fehlerhafte Funktion erfolgten Ueberanstrengung, resp. Uebermüdung.

Als Kuriosum mag noch des Auktionators Zenners gedacht werden, der beim Ausrufen der Zahlen einen Mundkrampf bekam, der ihn hinderte das Gewünschte auszusprechen.

Wir haben nun an Typen eine Reihe der wichtigsten Erscheinungen dargestellt. Es gibt aber noch eine grosse Reihe von Beobachtungen bei den verschiedensten Berufen, die nun ganz kurz dargestellt werden mögen, ohne dass wir Anspruch auf Vollständigkeit machen können. Bezüglich der Details verweise ich noch einmal auf die Darstellung von Macé de Lépinay.

Als Erstes mögen die Nähekrämpfe erwähnt werden, wie wir sie bei Näherinnen, Strickerinnen, Schneidern, Schustern, etc., beschrieben finden: Schwächezustände und Krämpfe der ersten Finger der rechten Hand bilden das Hauptsymptom. Leute, die sich beim Handhaben grosser Scheren überanstrengen, bekommen Krämpfe im rechten Arm und an der rechten Schulter. Aehnliches sieht man bei Leuten, die sich beim Bügeln überarbeiten.

Napias beschrieb Fingerschmerzen und Schwäche bei einem Emailleur von Photographien. Der Krämpfe der Barbiere haben wir schon oben bei der Differentialdiagnose von den Angstneurosen gedacht; Zittern scheint da das Hauptmotiv zu bilden. Bei Schmieden kommt bisweilen ein Schulterkrampf vor: Ueberhaupt erkranken die Leute, welche schwere Hämmer zu schwingen haben, nicht selten an ähnlichen Leiden.

Bei den Kuhmelkern kommen nicht allein die besprochenen Neuritiden vor, sondern auch bisweilen Krämpfe, welche den Neurosen zuzurechnen sind (von Basedow); auch bei Zeitungsfalzern werden ähnliche Dinge beschrieben. Remak beobachtete einen Gaslaternenanzünder, der jedes Mal innerhalb einer halben Stunde täglich einige siebzig Laternen anzündete, eventuell auslöschte und nun allmählich ein Versagen der Finger bei dieser Tätigkeit und nur bei dieser Tätigkeit acquirierte. Nicht selten treten bei Telegraphisten nebst den besprochenen Neuritiden auch Neurosen in Form von Schmerzen, Schwächezuständen und Spasmen auf. Berger sah sehr starke Flexionskrämpfe bei einer Zigarrenwicklerin, Goldmann bei einem Zigarettendreher. Man vergleiche auch die Untersuchungen von

Wilde. Duchenne sah bei einer Blumenmacherin Krämpfe des Zeigefingers; bei einem Fechtlehrer beobachtete er, dass sofort krampfhafte Rotation des Oberarmes nach innen auftrat, wenn der Mann in die "Parade" treten wollte. Ausser der bereits beschriebenen Kellner-Neuritis gibt es auch eine Kellner-Neurose. So sah Runge einen derartigen Patienten, der beim Versuche Teller auf der Flachland bei supiniertem Ellbogengelenk zu tragen, sofort Krampf bekam. Vereinzelte Beobachtungen beziehen sich auch auf Juweliere, Diamantschneider, Holzhauer, Tennisspieler.

Bezüglich der Aetiologie mag zuerst der Einfluss der Heredität besprochen werden: in einzelnen Fällen wird von direkter Heredität gesprochen; allerdings darf man nicht vergessen dass bei neuropathischen Menschen manchmal auch der Anblick von Leuten mit Beschäftigungsneurosen, resp. das Zusammenleben mit ihnen ähnliche Zustände provozieren. Gallard hat nach Seeligmüller bei 3 Mitgliedern derselben Familie (einen Notar nebst Mutter und Schwester) Schreibekrampf auftreten sehen, obwohl die beiden letzteren keineswegs Exzesse im Schreiben begangen haben. Ein Patient Cassirers ein 15jähriger Schüler, litt an der sensiblen Form des Schreibkrampfes, sein Vater, ein Klavierlehrer am Klavierspielerkrampf. Berger berichtet von einem Schreibkrampf-Kranken, dessen Onkel an derselben Affektion litt. Viel häufiger (aber durchaus nicht immer) findet man in der Aszendenz Nervenkrankheiten anderer Art, wie Neurasthenie, Hysterie, Psychosen, Basedow, etc.

Betrachtet man die von der uns beschäftigenden Neurose betroffenen Leute selbst, so finden wir eine Reihe von solchen unter ihnen, die man auch schon vor Ausbruch der Krankheit unter die Rubrik "Neurasthenie" hätte subsummieren müssen. Allgemeine Erregbarkeit, Depressionen, Phobien, Angstzustände, ferner somatische Beschwerden, wie Kopfschmerz, Schwindel, Herzklopfen, Dyspepsie beherrschen die Szene, kurzum es gibt kaum ein Symptom der neurasthenischen Gruppe, das hier nicht in Frage käme. Bei einer Anzahl von Fällen konnte ich leicht die kongenitale Anlage, i. e., das Frühauftreten von Nervensymptomen in der Kindheit nachweisen; andere hatten die nervösen Symptomenkomplexe später unter Einfluss der verschiedensten Noxen akquiriert. Unterernährung spielt da keine kleine Rolle, bisweilen auch der Alkoholismus; bein meinen Untersuchungen über die Nervenerkrankungen der Raucher habe ich auf den nicht seltenen starken Nikotinismus bei den uns beschäftigenden Kranken hingewiesen (vergl. diesbezüglich meine Monographie über die nervösen Erkrankungen der Tabakraucher, Wien, 1912).

Manche der Patienten sind mit Epilepsie, Stottern und Tic behaftet; Nephritis, Diabetes, Lues und andere erschöpfende Erkran-

kungen wurden öfters konstatiert. Auch sah man hie und da mit den Neurosen identische Komplexe bei cerebrospinalen Krankheiten (Lues, Tabes, Sklerosis multiplex) auftreten.

Die häufigste Noxe ist die berufliche Ueberarbeitung; Die meisten der Schreibkrampfkranken sind Berufsschreiber, die ausserordentlich beschäftigt sind: oft sind es Leute, die den Tag über unausgesetzt ihrem schweren Beruf obliegen. Da der Ertrag oft nicht reicht, um die Familie nur in der armseligsten Weise zu ernähren, übernehmen die Leute noch Privatarbeiten, die sie des Nachts ausführen. Es ist ja eine alte Erfahrung, dass nicht die Schriftsteller, sondern die Kopisten es sind, die erkranken. Man vergesse nicht, dass auch der gewandteste, fleissigste Schriftsteller Pausen bei der Arbeit macht, ja machen muss, während der Kopist unausgesetzt tätig ist. Ferner ist auch das Kalligraphieren ein Verfahren, das mehr zu Störungen führt, als die saloppe Schreibart der meisten geistigen Arbeiter. Als ätiologischer, resp. als mitveranlassender Faktor wurde vielfach die Einführung der Stahlfeder genannt, da erst zu dieser Zeit die Beschreibungen der Affektion auf grössere Frequenz deuten. Auch mag die Verwendung schlechter Federn, schlechten Papieres, schlechte Beleuchtung, schlechte Körperhaltung, ungeeignete Arm- und Handhaltung oft von Einfluss sein.

Bei einer Anzahl von Individuen findet man jedoch in der Anamnese die Angabe, dass sie nur mässige Schreibarbeit geleistet haben. Ich muss übrigens betonen, dass ich bei einer Anzahl meiner hieher gehörigen Kranken weder Ueberanstrengung, noch Allgemeinneurasthenie nachweisen konnte. Bei manchen von den Kranken konnte ich eruieren, dass sie zur Zeit der Entstehung der Affektion unter deprimierenden Verhältnissen gelebt haben. So erinnere ich mich eines 34jährigen ausserordentlich kräftigen Offiziers, der sich nie übermässig mit Schreibarbeiten beschäftigt hatte und der auch keinerlei neurasthenische Symptome aufwies. Bei näherem Examen eruierte ich, dass zur Zeit der Entstehung der Affektion die Frau des Patienten ein lebensschwaches Kind geboren hatte. Monatelang strengte sich die Mutter und mit ihr der Vater mit der mühsamsten Pflege an; trotzdem starb das Kind. In dieser Sterbenszeit begann sich der Schreibkrampf geltend zu machen.

Sorgenvolle, aufreibende Krankenpflege ist überhaupt ein Motiv das sich nicht selten in den mir vorliegenden Krankengeschichten findet. Interessant ist die Beobachtung Oppenheims, die zugleich ein wichtiges Beispiel für die Bedeutung psychischer Einflüsse bildet. Bei einer Dame entwickelte sich die Affektion, nachdem sie ihren Gatten wegen Paralysis agitans gepflegt hatte; während dieser Pflege fürchtete sie sich permanent auch von dieser Krankheit befallen zu werden.

66692—VOL 3, PT 2—13——6

Manchmal entwickeln sich die beschriebenen Zustände unmittelbar anschlie Bend an einen Schreck oder allerdings ganz selten an ein mit Schreck verbundenes leichtes Trauma. Interessant ist der Fall Oppenheims, in dem sich die Störung in unmittelbarem Anschluss an eine spiritistiche Sitzung zeigte. Nicht unwichtig scheinen mir dreir Beobachtungen aus meiner Praxis, bei denen sich psychischer Chok bei der Entstehung des Krankheitsbildes nachweisen liess: Ein zirka 30-jähriger Beamter hatte mit seiner Familie nicht ohne eigene Schuld in grossem Unfrieden gelebt. Er wurde erst wieder nach Hause gerufen, als seine Mutter plötzlich gestorben war; selbstverständlich war er durch dieses Ereignis tief erschüttert. Man ersuchte ihn die Todesanzeige niederzuschreiben. Als er sich dazu anschickte, versagte ihm die Feder und er konnte kaum mühsam einige Worte schreiben. Der Zustand blieb bis zu dem viele Jahre später erfolgten Tode trotz mannigfacher Kurversuche stabil.

Ich erinnere mich eines anderen Beamtem, der an erheblichem Schreibkrampf litt: Er erzählte, dass er als Soldat eine gute Handschrift hatte. Er wurde in der Unteroffiziersschule mit Andern von einem Affizier in der Kalligraphie unterrichtet. Einmal gab eine seiner Schreibaufgaben dem Lehrer Anlass zum Tadel, den er dahin äusserte, dass eine derartige saloppe Schrift nur von einem Menschen mit schlechtem Charakter geschrieben sein könne. Dieser Ausspruch machte auf den jungen Mann eine furchtbar deprimierende Wirkung und zog einen unheilbaren Schreibkrampf nach sich.

Ein atypischer Uebergangsfall soll hier noch erwähnt werden: Ein etwa 30jähriger Mann berichtete mir, dass er als Student in alcoholicis nicht gerade mässig war. Eines Morgens wachte er nach einem derartigen Exzess mit einem starken physischen und psychischen Unbehagen, mit einem sogenannten "Kater" auf. Unvermuteterweise kam der Briefträger ins Zimmer und verlangte eine Unterschrift; im selben Momente hatte der Kranke die Angst, dass sein Zustand dem Eingetretenen auffallen könnte und dass derselbe bemerken würde, dass Patient vor Zittern nicht schreiben könne. Er kontte seine Unterschrift nur mit grösster Mühe geben; von dieser Zeit an konnte er nie mehr in Anwesenheit anderer Menschen schreiben. Wenn er allein war, war er von Schreibstörungen frei.

Wie gesagt—der Fall gehört streng genommen nicht hieher, da er zur Gruppe der Phobien zu zählen ist. Er mag aber schon deshalb hier Platz finden, weil wir eine Reihe von sogenannten "echten" Scheibkrampfkranken sehen, die, allein gelassen, noch eine gewisse Leistung aufbringen—in Gegenwart Anderer aber ganz versagen.

Wir sind durch die letztbeschriebenen Fälle darüber belehrt worden, dass es unter Umständen eine Art von fast apoplectiformem Einsetzen der Erscheinung gibt; man würde aber sehr fehl gehen, wenn man diesen Verlauf für häufig halten würde. Der gewöhnliche Ver-

lauf ist meist ein sehr schleichender: anfangs treten die Zustände nur ganz sporadisch, nur im Anschluss an besondere Anstrengung auf; allmählich werden sie immer häufiger, immer intensiver; es vergehen aber Monate, ja manchmal Jahre, bis es zum völligen Versagen der Tätigkeit kommt. Gewöhnlich macht sich der Defekt erst im Laufe des Schreibens geltend; während die ersten Worte noch halbwegs leserlich sind, werden die Zeichen immer undeutlicher, bis sie endlich kaum mehr Buchstaben ähneln. Anfangs können die Leute eventuell noch mit Gänsefedern oder Bleistift passabel schreiben; später versagen auch diese Hülfsmittel.

Bei der nun folgenden Besprechung der Symptomatologie wollen wir der üblichen Einteilung in die spastische, paralytische, tremorartige und neuralgische Form folgen, wobei wir hervorheben, dass wir uns wohl bewusst sind, dass Uebergangsarten und Kombinationen durchaus nicht selten sind:

(1) Die spastische Form tritt meist im Gebiete der Beuger auf—am häufigsten sieht man sie am Zeigefinger, dann am Daumen und Mittelfinger, seltener am vierten und fünften. Die Patienten nehmen die Feder in gewohnter Weise zur Hand, schreiben etwa drei bis vier Worte halbwegs erträglich, dann aber zieht sich der Zeigefinger palmarwärts, der Patient streckt ihn mühsam, macht wieder einige allerdings unvollkommene Buchstaben; wieder tritt Krampf auf, nun gelingt ein Spontanstrecken kaum mehr, der Kranke nimmt die linke Hand zur Hülfe, streckt passiv den widerspenstigen Finger, legt ihn nochmals in gestreckter Lage auf den Federstiel, macht wieder einen fast vergeblichen Versuch zum Schreiben. Nun gelingt kaum mehr ein Strich—der Patient ruht aus. Kaum dass er aber wieder ansetzt, fängt das Spiel von Neuem an. Seltener treten Ab- und Adductionsbewegungen resp Oppositionsbewegungen der Finger auf. In anderen Fälen kommt es zu Streckkrämpfen; der Zeigefinger wird manchmal nur ein wenig aufgehoben, so dass den falschen Eindruck einer Willkürbewegung hat, manchmal schnellt er plötzlich in die Höhe. Auch die anderen Finger, namentlich der Daumen, machen die unwillkürlichen Bewegungen mit. Bisweilen nehmen auch die Muskeln der übrigen Gelenke an dem Krampf Teil; ganz selten sind Krämpfe derselben bei ruhig bleibenden Fingern. Beuge-Streck-Seiten-Bewegungen werden ab und zu beobachtet, bisweilen auch Pro- und Supinationsbewegungen im Ellbogengelenk. Quaret-Faslem sah isolierten Schreibkrampf im Pectoralis major und Deltoideus bei einem vielschreibenden Kassaboten. Der Man war 17 Jahre Trompeter gewesen und spannte in seinem Berufe beim Halten seines Instrumentes die beiden erwähnten Muskeln. Putnam beobachtete auch Mitbeteiligung des Trapezius und Sternocleidomastoideus zuerst nur rechts, dann auch links.

Die 2. Form die tremorartige, dokumentiert sich dadurch, dass die Patienten beim Schreibeversuch von Zittern der Hand oder des ganzen Armes befallen werden, so dass die Schrift den deutlichen Tremor-Charakter bekommt. Diese Form kombiniert sich nicht selten mit der nächsten.

Die 3. Form ist die paralytische; ich habe den Eindruck, dass sich da nicht selten ataktische Elemente beimengen, so dass man eigentlich von einer paralytico-atactischen Form reden könnte. Hieher gehören die Leute, welche die ersten Worte oft noch recht gut schreiben; dann tritt aber ein rätselhaftes Stocken auf, ein förmliches Kleben auf dem Papier. Nach kurzer Ruhe gelingen wieder einige Worte; dann wiederholt sich das Versagen in verstärktem Masse, wobei mir eine gewisse Ataxie bisweilen auffiel. Oft ist die Störung nur in den Fingern; sie kann so stark werden, dass die Kranken plötzlich die Feder aus der Hand verlieren. In einzelnen Fällen sah Berger die Schwäche aber ausschliesslich in der Schultermuskulatur auftreten.

Als 4. Form wird die neuralgische bezeichnet: Schmerzen begleiten allerdings auch ziemlich oft die oben beschriebenen Formen. Eine rein neuralgische Schreibstörung ist selten, und manche der hieher gerechneten Fälle dürften eigentlich den Brachialgien und den verwandten Erkrankungsformen zugehören.

Begleiterscheinungen der beschriebenen Formen sind nicht zu zahlreich. Bisweilen erweisen sich die Nervenstämme als leicht druckempfindlich; allerdings hat man hie und da die Idee, dass die Druckpunkte vielleicht etwas hineinsuggeriert worden waren; ebenso mag es sich mit den in der älteren Literatur öfters erwähnten Wirbeldruckpunkten verhalten. Auch bisweilen zu konstatierende leichte Hyperalgesien resp. Hypaesthesien des Armes erinnern an hysterische Bilder. Ich finde ferner vermerkt, dass der Arm bisweilen kälter wird, Schweissausbruch aufweist, sich verfärbt, bläulich-weiss erscheint. Ich habe diesbezüglich nichts Beweisendes gesehen; wenn ich auch die Möglichkeit derartiger Begleitsymptome nicht ganz leugnen kann, so muss ich sie doch für selten halten und ich kann mich des Gedankens nicht erwehren, dass in den älteren Beschreibungen die Abgrenzung von Neuritiden und vasomotorischen Neurosen nicht immer genau genug durchgeführt wurde.

Reflexanomalien werden für gewöhnlich nicht beobachtet. Die motorische Kraft ist in den meisten Fällen sehr gut, in einer kleinen Anzahl leicht herabgesetzt. Bemerkenswert und für die Stellung der Diagnose äusserst wichtig ist der Umstand, dass die Patienten, so unfähig sie auch zum Schreiben sein mögen, für andere Verrichtungen besonders gewandt sein können. Ein Arzt, der an Schreibkrampf litt, war als laryngologischer Operateur sehr bekannt. Ich

behandelte einen renommierten Klaviervirtuosen, der durch 30 Jahre Mogigraph war, dessen Spiel aber tadellos blieb. Ich kannte Schreibkrampfkranke, die gute Pistolenschützen waren, auch einen, der die feinsten, schwierigsten Zeichnungen machte.

Ausnahmen davon habe ich—gleich anderen Autoren—ab und zu gesehen: Manche der Leute klagen darüber, dass sie auch bei anderen Beschäftigungen (Musik, Nähen, Schiessen, Zeichnen, Malen, etc.) Störungen bemerken. In manchen Fällen mögen da hypochondrische Vorstellungen eine Rolle spielen, in einzelnen Fällen kommt es vielleicht tatsächlich zu einer minimalen Minderwertigkeit der Leistung; eine deutliche Herabsetzung der Leistungen in hohem Grade habe ich eigentlich nie entstehen gesehen. Doch will ich nicht versäumen zu erwähnen, dass einzelne Fälle in der Literatur verzeichnet sind, die Leute betreffen, bei denen sich im Laufe der Zeit zwei Beschäftigungsneurosen etablierten, z. B., Telegraphistenkrampf neben Schreibkrampf oder Verbindung letzterer Form mit Musik- oder Stenotypistenkrampf.

Wichtiger als diese letzterwähnten, ganz vereinzelten Vorkommnisse ist die Frage nach der Leistungsfähigkeit der zweiten, zum Schreiben nicht verwendeten (meist linken) Hand. Die Patienten haben für gewöhnlich keine Klage über dieselbe; sie lernen oft aus eigenem Antrieb oder auf ärztlichen Rat das Schreiben mit der gesunden Hand und bringen es in relativ kurzer Zeit zu einer genügenden Geschicklichkeit. Bei Manchen der Kranken erhält sich die neue Technik dauernd; häufiger scheint es aber vorzukommen, dass nach einer Reihe von Jahren der Krampf die zweite Extremität ergreift. Ich sah dieses unglückliche Ereignis einmal 12 Jahre nach Erlernung der neuen Schreibart auftreten.

Dass die Leute nebst dem eigentlichen Schreibkrampf auch noch andere allgemeine nervöse Erscheinungen haben, ist ja schon genug gewürdigt worden. Hier mag nur noch des Steigens der Allgemeinnervosität bei den Schreibversuchen erwähnt werden: die Leute werden unruhig, erblassen, bekommen Herzklopfen und können nicht ruhig sitzen.

WHAT OCCUPATION NEUROSES REALLY ARE.

Dr. Tom A. Williams, M. B., C. M. (Edinburgh), Washington, D. C.; member of British and of American Medical Associations; charter member American Psychopath Association; collaborating editor Journal of Abnormal Psychology, etc.; neurologist to Epiphany Dispensary; corresponding member Societies of Psychology and Neurology, Paris.

The term "neurosis," where it concerns occupational disabilities, is a misnomer, for disorders of occupation to which this name has been given are in reality psychodynamic inhibitions or disorders in the habitual series of coordinated associations gained by education in some art. A want of harmony in the controlling of the mechanism is the fault. Hence the disharmony is always psychological.

This is easily proved by the fact that the neuromuscular apparatus which fails to perform a particular occupational act can quite well accomplish any other act, and this by means of the same muscles, nerves, and brain areas. Hence. the interpretations of Hartenberg that hypotonia is the efficient cause of the professional dyskinesias attributed to neurosis fall to the ground. Nor can we accept Kouindjy's explanation of an ataxia, which he believes because of the favorable effects of reeducation.

Hypotonia or ataxia, when present, are mere secondary effects of a primitive dyskinesia induced by a disharmony which has originated ideationally, although the mechanism through which it occurs is largely emotional. The following considerations are explanatory:

The induction of emotions by ideas is more clearly shown in a more acute form than occurs during the steady pursuit of an occupation. We find it best illustrated in the psychogenetic effects of accidents, and the maintenance of these by the patient's own painful ruminations thereupon, through what amounts to chronic fear and its effects upon the internal secretions.

THE RÔLE OF EMOTION.

An accident short of lesion may create in a susceptible person so great a fear as to cause a sudden increase of secretion by the thyroid gland. The recent researches of Crile have shown that this occurs almost constantly in patients with hyperthyroidism when they are frightened by the prospects of an operation; it occurs in these subjects as a result of anxiety or unusual excitement. Crile believes that the thyroid gland is an organ by means of which there is rapidly available a store of an activating substance for the use of the neuromuscular apparatus when there is special need of its greatest power. Such an occasion is presented by the need for escape from danger. As the preservation of the species in locomotory animals may depend upon capacity to respond suddenly with the maximum of vigor

against impending danger, there has developed through the long course of phylogeny this special organ of storing and rapidly setting free, when required, such a substance as the thyroid juice. But it would be a mistake to confine the need for the greater activation of the gland to physical escape from danger in the crude sense. In the higher animals, life is no longer regulated by experiences purely phylogenetic by the instincts. It is in the main controlled by ontogenetic incidents which we call experience, and which modify the reactions in fashions incalculably complex. The determinators of these modifications we call association of ideas. Now, quite apart from the fear of bodily harm, there is a vast series of possible events which man seeks to avoid, and which he apprehends as dangers from which to escape. It is reasonable to believe that psychological situations of this kind are capable of reflexly demanding the hyperactivation afforded by the thyroid juice. That is, fear from any source may create a temporary hyperthyroidism.

But that the thyroid secretion is not the only one modified by emotion has recently been shown by a brilliant research of Cannon. He has shown that the emotion of fear in animals is capable of stimulating the flow of adrenal secretion. He demonstrated that, in frightened animals, the blood from the adrenal vein is so rich in adrenal substance as to be capable of inhibiting peristalsis in an isolated strip of intestinal muscle. This is due to the presence of the adrenal substance in appreciable amount, since it requires contact of the latter (with the intestinal strip) in a one-millionth solution at least to inhibit peristalsis.

We knew that the emotion of fear could inhibit gastric secretion, and Pawlow has shown that certain emotions of anticipatory joy can induce a flow of this secretion.

While it lasts, the fear state presents marked physical symptoms. It does so through the intervention of the autonomic nervous system, which can not be controlled directly by volition, except in rare cases, and those only after much practice. One such case I saw in Philadelphia recently with Dr. J. Madison Taylor. This man, an athlete, had devoted much attention to control of his reactions. He is able to provoke at will the pilomotor reflex, which produces the gooseskin appearance. He claims, too, that he can modify the rate of his pulse, but he did not succeed in demonstrating this clearly to me. He is able also to bring tears to his eyes by purely psychological means. Careful analysis shows that none of these reactions occur from pure willing. To produce them he has to assume a peculiar emotional state, which he describes as one of mystery. His introspection of this is not clear enough for one to say that it is not a feeling of horror. He thinks it is not, because it is rather pleasant, but the pleasure may be that of accomplishing something for which

he strives. The analysis need not further detain us, for I quote the case only to draw attention to the impossibility of affecting the autonomic nervous system by direct volition, and to show the need of the intermediary of emotion for provoking autonomic reactions.

The above case may be compared with the simpler one described by Babinski, and which I observed in Paris, in 1907. This timorous young girl, without practice in control, was so apprehensive of the pin scratch used to elicit the plantar reflex that she involuntarily drew up foot and leg at the approach of the pin and then occurred pilomotor contraction upon the skin over the upper and outer part of the thigh overlying the muscles (tensor fasciæ latæ reflex), which contract in the defense reaction when one strokes the sole. The patient could not control this response in any way; and its strict localization is unlike that of the preceding case, in whom the goose skin was general when it came at all.

Of course, these cases are somewhat peculiar, but horripilation is a very common reaction to alarm.

Other common consequences are alteration of pulse rate and pressure. The frequency may become more or less than normal and the pressure may be raised or lowered. Perhaps these differences depend upon the neurological type, or they may be functions of the varying responsiveness of the ductless glands in various individuals or at different times.

Upon the digestion, the effects of alarm are well known to be malappetite and constipation with all their accompaniments.

Upon the respiration, fear acts by a complete arrest followed by exaltation, or mere shallowing may ensue. It is a consequence of the inhibition of muscular activity known as fear paralysis. This may be regarded as a phylogenetic mechanism for stabilizing an individual preparatory to efficient action.

The effect of terror upon the flow of urine and control of the bladder needs only mention.

Even the ancients knew, too, how fear arrested the sexual functions.

But the autonomic modifications of secretions soon cease as the fear shock of the accident fades; and, in a few days, at most, the animal experimented upon or the human being insulted resumes stable equilibrium.

PSYCHOGENETIC FACTORS IN MODIFYING IDEAS, FEELINGS, AND ACTS.

Sinistrosis.

But this benign eventually is often interfered with in human beings by the property they possess of reviving in memory the ideas which clothe situations with horror, apprehension, anxiety. Espe-

cially prone to this damaging sequence are persons whose imagination has been made rampant by the cultivation of the credulous fears of childhood; their fear reaction to that which they do not understand is a dominant one, and they are easily beset by an idea linked with fear. The commonest of the fears which result from accident or injury is that of bodily harm. It is very hard for a person of this type, when ignorant of his own structure and functions, to shake off the foreboding created by an impressive catastrophe, and it must not be forgotten that what others regard as trifling, the victim may look upon as catastrophic when judged by its possible effect on him.

Prepossession by the idea of one's own disability is an inevitable consequence. This leads to abstraction from and inattention to the affairs of ordinary life, which, if not trifling by comparison in the patient's mind, at least can not claim the attention properly needed. Hence ensues the well-known diminution of the capacity to think, work, or take part in social life. This incapacity, when the patient becomes aware of it, leads him to still further accentuate the result of his injury, and thus to augment his alarm about his health. Thus is constituted the vicious circle of hypochondria. Even a nosophobia may ensue, such as the fear of lost manhood, insanity, paralysis. Alarm at this impending disaster must, of course, be distinguished from the primary alarm due to the accident itself.

The next step in the drama is the reaction against the actual absence of physical signs of injury, and the reassurances of medical men. This takes the form of an unconscious search by the patient of ratification for his belief that he is indeed damaged. Hence arises the familiar exaggerations and falsifications of symptoms. These are made in perfect good faith and honest belief, but they lead to the simulation of disease pictures previously in mind, or acquired in the course of the disorder.

It is only after the patient begins to be convinced in his heart that he is mistaken that there ensues the deliberate self-deception of the desperate effort to preserve the respect of himself and his friends which he feels he would lose by admitting the absence of physical disorder after all.

By means of this mechanism may arise what Brissaud called sinistrosis. Even a favorable settlement of a lawsuit may not remove this attitude. Only skillful psychotherapy will do so; and, in severe cases, considerable time must be allowed to wear down the sinister habit of mind.

This mechanism was clearly illustrated in the case of sinistrosis, which I fully reported to the International Congress of Industrial Accidents at Rome, in 1909.[1] The rapidity of the success of the treatment in this and other cases is due to the thoroughness of the analysis which leads to the comprehension as there described. The

treatment consists of rational psychomotor discipline by which the patient is enabled to reeducate himself and get rid of a dyskinesis, which is, in reality, a dysboulia.

THE MECHANISM IN OCCUPATIONAL NEUROSES.

In the occupational psychoses, for so they are, the mechanism is entirely similar, as is well seen in the case which follows:

F. W., aged 30, a telegraph operator, complained of cramping of the wrist and hand while using the Morse sender, the typewriter, or the pen. Cramp sometimes occurs upon lifting a cup to drink, but only if he thinks of it. It occurs also upon brushing his teeth, but only those on the right side. It does not occur upon lifting up articles, unless he uses the fingers alone, when cramp may occur, but he can wind his watch, button his coat and collar, and perform other ordinary acts without cramping.

The cramps.—The movements consist of a flexing of the wrist when using the Morse key; an extension of the ulnar fingers when using the typewriter; a rigidity of the wrist when brushing his teeth; a giving way and radial rotation of the wrist on lifting a cup to his mouth; a rigidity of the whole arm when attempting to write.

He is completely incapacitated from his usual work, but is able to address envelopes in pencil in the rigid fashion mentioned.

The history.—The personal and family history were unimportant, except that he had a nervous sister and was disappointed that he could not follow his father's profession of medicine, and had to work from boyhood. He neither drank nor smoked. Although ambitious, he does not think that telegraphing was his forte, for, though he had tried hard enough, others with less education did better. He had not realized this, however, until he was too old to easily find something else which paid as well. Perhaps he had found learning harder than most people, because he tried to learn at night, while working as a clerk in the daytime.

Although 10 years ago, after falling from a bicycle and dislocating his shoulder, he had worked in pain for five weeks before reduction was made (not, however, at the key, but in writing); no disability had followed. He had not learned the Morse key in the usual way of the lads who pick it up as office boys and evolve into operators, for he began intentionally to learn when he entered an office at 14, and after four years could send 40 to 45 words per minute steadily, with few mistakes.

Origin of the cramp.—The cramp occurred suddenly six years ago with "a kind of loss of use of the wrist, which would go up in the air while he was using the keys." At the same time, the hand would flex. At the period when this occurred he had been sending in the daytime for a stockbroker from 9.30 a. m. to 4 p. m., whereas formerly he had never used the key for more than three or four hours, and that in the evenings. The stockbroker's work had to be done quickly, and he felt it a strain, but he liked it in spite of its arduousness, for it did not seem to interfere with his health, although he had to eat lunch in the few minutes he could snatch at his desk. His only worry, before the cramp occurred, was the fear of not being able to do his work and of losing his position. Just before his disability began he had found that he was not making his letters correctly and could not go fast enough for the work. He had to give up his position in about 10 weeks after the occurrence of the cramp.

Physical examination was in other respects negative, except for an exaggeration of the deep reflexes.

This summary analysis must be compared with and interpreted in the light of those I have published in the Journal of Psychology and Neurology of Leipsic, 1912 (Bul. 19). There, three cases of writer's cramp of different complexity are fully presented, and the method of management which led to their recovery is described, and the principles thereof are set forth. They were, shortly, as follows:

ILLUSTRATIVE CASES OF OCCUPATIONAL "NEUROSIS."

Case I.—A paymaster was obliged to sign over 200 checks a day. After an attack of "grippe" his signature had become a little uncertain, and one day it was refused by the bank. Dread of losing his position further augmented his difficulty; but he consulted me early, and one interview placed him in the way of cure after a few weeks' absence from work. His hardly legible scrawl at that time contrasts sharply with the bold and clear signature two and a half years later. The steps in the treatment were: (1) Discovery of the cause, an induced fear; (2) removal of the besetment; and (3) correction of the awkward position of the hands and the excessive rigidity of the muscles of the arm. This last was accomplished by gymnastics designed to give free movements and by the frequent practice of free writing in a smooth, large, round hand, a little at a time.

Case II.—A woman had always disliked correspondence, and in consequence wrote very rapidly. During a time of domestic stress and anxiety on account of sickness, she was particularly impatient of the Christmas letters she had to write, and the cramp ensued. When I saw her, two and a half years later, however, there was no marked fear affect nor insistent desire to recover. But, in about three months, she gradually became able to write a normal hand without difficulty, as a result of graduated exercises made possible by freeing her mind from the besetment which produced the cramp when she attempted to write.

Case III.—Singer's cramp and pen paralysis in a psychasthenic young woman. At the age of 19 she received, after a concert, an anonymous letter which created shame when she sang in public thereafter. Her anxiety to be a successful singer, in conflict with this shame, produced a pharyngeal cramp, in consequence of which she had to give up singing for some years. Fear of laryngeal tuberculosis also played a part in this. Some years later a period of stress and poor health, combined with hyperconscientious efforts to do full credit to a difficult clerical post, led to writer's cramp. She was sent to me two years later, after various unsuccessful medical and orthopedic attempts had been made to cure her. She was in despair at being unable to write, as she had to make her living; and although she had persevered, she could not face an audience in solo, so that her earnings as a singer were insignificant. After six months of most arduous treatment she became able to write perfectly with both left and right hands, and the singing cramp was greatly improved. She has already taken a clerical position, and is about to take a choir position once more.

In this case the chief difficulty was to overcome the patient's false belief in a physical disease, first in the hand, then in the shoulder; later, in the constitutional state due to a hypothetical tapeworm, and, finally, belief in a cerebral defect of neurasthenic type not psychological in mechanism. Eventual success in removing these beliefs led to the fruitful practice of gymnastic and calligraphic exercises, which before that had only aggravated her disability. (The patient has since relapsed as to writing with the right hand, but has learned to use the typewriter with it; has sung regularly for over a year.)

These cases clearly show the prepossession of the patient by *the idea of disability.* This notion breeds anxiety regarding capacity to perform the task required, writing or singing or what not. The nervous erethism of the anxious state is concentrated upon the apparatus required for performing the desired act of occupation. In this way, there is induced the state known to golfers as "pressing," and seen familiarly in the stammering movements of those who are apprehensive under unusual mental stress in the performance of an act.

Physiologically there occurs an involuntary innervation, lacking in proper coordination, mainly of the muscles about to perform the desired act. Instead of being in a state of tonic relaxation, the normal physiological one, they are already beginning to contract before the voluntary inception of the professional act. Both agonists and antagonists may contract irrespectively of one another.

The condition is quasi volitional, as it is contingent upon the mental processes preliminary to the occupational act. Its incoherence is due to emotion, and the emotion—fear—is due to the idea that the act can not be performed. This idea has arisen in various ways, as shown by the cases.

CRAMP NEUROSIS IS A TIC.

When occupational neurosis is dyskinetic in type, as in the cases cited, the cause of the disability is in reality the preemption of the muscles required in the act by a tonic tic. It is ideational in origin, and conforms in every way to the well-known definition of Janet into which I need not enter here, as I discuss it in the memoir cited and in the current number of the Journal of Abnormal Psychology (September, 1912).

But when there is no question of dyskinesis in an occupational psychosis, the mechanism is essentially the same. For tic is merely a motor obsession contingent upon the idea of certain situations within or without the body. Pure besetment without motor expression is essentially the same in a psychological sense, as so clearly shown by Janet.[2] Neither of these manifestations is ever unaccompanied by phobia or Angst. So much so that some have regarded anxiety as the genetic factor of obsessions. The clinical evidence that this is not so is abundant. That it is the notion of the situation in the patient's mind which is the determinant of the emotional reaction of his body, is shown by a series of analyses of children made by the writer before the American Psychopathological Association (May, 1912),[3] as well as in a theoretical discussion with casuistical illustration.[4]

It is this state of obsession, expressing itself in the fear of one's occupation, which has so unfortunately received the name of neurosis;

for the name leads to the idea of therapeutic intervention toward the lower neurones, such as their stimulation by strychnine and other drugs believed to be tonic in effect; such as by giving douches to arouse the nervous system; by attempts to improve nutrition; through massage, exercise, more nourishing food; by the imposition of rest, on the supposition that there is exhaustion of the nervous system; by prescription of change of scene, under the idea that the patient's balance will be thereby restored. These measures, excellent enough when indicated, are quite beside the mark in the affection we are considering.

The essential preliminary to treatment is the getting rid of this idea. But before this is done, the patient must be thoroughly convinced of the fact that it is this idea that produces the disability, and that his previous belief that the disability is of physical origin, whether of muscle, nerve, or brain, is utterly erroneous. In other words, he must clearly comprehend the phsychodynamic genesis of his condition.[5]

The second step is for him to reacquire control of the psychomotor mechanism required in his occupational acts. This can only be attained by practice. In proportion to the length of time the perverted kinesis has obtained, these efforts to rectify it are difficult and prolonged. Thus the naval paymaster, who had been incapacitated only a few weeks, was restored in less than a month, after one interview. The woman who had practically ceased writing for two and a half years required four treatments and about four months of practice before she could again write freely. The young woman with multiple professional cramps required six months of the most arduous discipline and frequent consultations before she could again write with the right hand and sing without cramp of the throat. In the cases of numerous telegraphers I have studied, no treatment at all was undertaken, because in part of the long standing of their condition; but mainly because the tiring work of a telegrapher does not leave enough energy for the arduous discipline required for reeducating the mechanism of the professional act so complex, delicate, and exacting as the use of the Morse key.

Theoretically, it is clear, and, practically, my cases show, that there is only one direct therapeutic means for them. That may be summed up as psychotherapy.

Of course, the effort demanded in a psychotherapeutic education requires for its best fruit a well nourished nervous system; and the patient's hygiene must therefore be rectified, when defective; but that is only a help, and not a cure.

The same consideration applies to prophylaxis. It is of course desirable that workers should be well nourished, and that fatigue should be minimized; but this, in itself, will not prevent occupational

neurosis, if the ideational seeds are not prevented from germinating in the minds of the workers.

[1] See Transactions; also, Medical Record, New York, May, 1909.

[2] Les Obsessions et la psychasthénie. Paris, 1903.

[3] Jour. Abnor. Psychol., 1913, Am. Jour. Med. Sci., 1912, Dec.

[4] Jour. Abnor. Psychol., July, 1910: The rôle of the affective and intellectual processes in traumatic neurosis.

[5] Much information will be found in author's papers. Recent works upon hysteria, *J. A. M. A.*, Dec. 21, 1912. Ten cases of hysteria, Wash. Med. Annals, Jan., 1912. Postgraduate June, 1912, psychogenesis of physical symptoms is there strikingly set forth.

AN UNUSUAL FORM OF MINERAL POISONING AFFECTING THE NERVOUS SYSTEM. MANGANESE?

Louis Casamajor, M. A., M. D., chief of clinic, Neurological Institute; assistant neurologist, City Hospital, New York City.

A certain indication of the humanitarian trend of modern times is the ever-increasing interest in the intoxications and diseases coincident with various trades. The ill effect that arsenic, lead, and phosphorus has upon its workers started this line of investigation, and these intoxications have been so well studied that their clinical pictures are clearly fixed in the mind of every physician. Undoubtedly the most serious and permanent of trade diseases are those which affect the nervous system. It is hardly necessary to go into details here of the various nerve poisons to which workmen are exposed, but a reminder of the portions of the nervous system affected may not be out of place. The peripheral nervous system is the one most often involved, and it is here that diagnosis is simplest. Lead and arsenic give most of our causes of occupation neuritis, but they are not the only ones. Copper, mercury, phosphorus, carbon bisulphide, aniline oil, and the cyanides have been known to give the same bad results. Of industrial poisons affecting the central nervous system much less is known. Besides lead, which affects, principally, the vessels of the brain, and so causes nervous symptoms, practically nothing is known. The ultimate pathology of most of the central nervous-system diseases is still unknown to us, and so one may easily speculate on causes of central nervous-system symptoms.

In the cases I will report here one is brought face to face with the possibility of the selective central nervous-system poisoning arising in metallic workers. The clinical picture, while confusing, is not altogether unknown in certain metallic workers. In its causation one has to look toward mineral substances formerly considered safe and harmless. Zinc has been extensively used by man since earliest times, and, by practically all authors, has been considered

innocuous to the human system, if one may exclude the irritating effects on the gastro-intestinal tract, which all the heavy metals possess in common. Of manganese much less is known, as its use is far less extensive. The question I would raise before you now is, Can these substances cause a specific nervous system intoxication under proper conditions?

The cases presented here came under the author's observation among some workers in the separating mill connected with a large mine, from which zinc is the principal product In order to make the genesis of this condition clear a description of the materials, methods, and working conditions is necessary.

Eighty-five different ores are found in this mine. One ore, a sesquioxide of zinc, iron, and manganese, makes up 45 per cent of the bulk of the ore body. Willimite, a silicious oxide of zinc, forms 21 per cent. Rodenite, a silicate of manganese, 9 per cent, and the red oxide of zinc 4 per cent. The other 81 ores make up the remaining 21 per cent in varying quantities. Lead and arsenic may be absolutely excluded as causative agents. No trace of arsenic is ever found in the ore. Minute, indeterminable traces of lead are occasionally found in the routine analyses. That lead may be absolutely excluded becomes apparent when we consider that the first grade of commercial zinc must assay less than one four-hundredth of 1 per cent of lead. The zinc recovered from this mine is always first grade, and no measures are ever necessary to remove the lead.

The ore, as it comes from the mine, is run through crushers, after crude lumps of limestone and other foreign matter have been removed by hand, and, with screens, is divided into eight different sizes, varying from 0.074 to 0.020 inch. Each size then goes to a separate set of electric separators. These separators are what are said to be the strongest electromagnets in the country. There are 32 of these separators, in all, in the mill, and each one consists of 6 electromagnets which vary in strength, according to the size of the ore used. The weakest contains 20,000 ampere turns, and the strongest, 100,000 ampere turns. The ground ore, varying in size from a coarse sand to a fine powder on the different separators, then passes under the magnets on belts, and the magnetic ores—i. e., those containing iron and manganese—are picked off by belts running over the face of the magnets, and deposited in bins. The rest of the ore then drops to the floor below, and the zinc silicate and red oxid are separated from the impurities by a specific gravity method. The electric separation is done with the ore thoroughly dried and the specific gravity method is done under water.

As most of the handling of the ground ore is done in the dry state the dust problem has been one of much concern. The mine authorities have taken many ingenious means to reduce the amount of dust in

the mill, and have eliminated a great deal of it. Nevertheless, throughout the mill, except on the floor where the water separation is done, the air which the workmen breathe is laden with a very fine gray dust, so that the atmosphere looks like a rather dense fog. In this mineral fog the men work in long shifts, and at the end of their day they are thickly coated with dust. A well-appointed washhouse adjoins the mill, in which the men may take a full shower bath, and change their clothes, before leaving for their homes. It is probably due to these precautions that cases such as I report are so rare.

The material for this paper consists of nine cases occurring in men working in this mill, and nearly all of them acquired the condition while working in, or shortly after being transferred from, the part of the building where the electric separators are situated. The history is practically the same in all cases.

After the man has worked in the dust for a length of time, varying from six months to three years, he begins to notice that he has difficulty in walking, the main feature of which is that the patient is unable to walk downhill slowly. On a level ground and uphill he has no trouble, but when he once starts to walk down an incline he gets going faster and faster until at length he must run to keep himself from falling on his face. He is unable to stop, and must keep on with ever-increasing speed until he runs against some object which stops him, or he falls down. This propulsion gait is accompanied by a very marked tendency to retropulsion, and the patient finds that he can not walk backward at all without immediately falling. Such was the history of the onset in all of our nine cases. With the onset, pain and stiffness in the legs were noticed in four cases, insomnia in one, and difficulty in writing in one. This patient complained that he could not well control his hand in writing, and that the figures he made were smaller than those he used to make. This is similar to the difficulty in writing which occurs in paralysis agitans.

While the symptoms of this condition are few, they are, nevertheless, very definite. The patient complains of very little except of propulsion, retropulsion, and unsteady station. The eyes are normal in every respect, and about half of the cases have very defective hearing, not due to middle-ear disease. The speech is slightly slurring in some cases. The face, in all the men, has somewhat of the flat, masklike character of paralysis agitans. There is more or less tendency to impulsive laughter. Tremor of the tongue is common, as is also a fine static tremor of the hands. There is never any rest tremor. The deep and superficial muscle reflexes are all active and equal. The legs feel weak and shaky, and the station is insecure. Propulsion and retropulsion in the gait are the most characteristic features. Asynergia is always present in the well-developed cases. The laboratory offers us very little aid in the diagnosis. The blood

never shows the changes so characteristically seen in lead poisoning. The urine is negative in those cases we have investigated. The presence of zinc and manganese in the urine of workers will be spoken of later. Wassermann reaction was done on the serum of five of the cases, with negative results in all. The spinal fluid was examined in three, with negative findings. On the mental side, nothing characteristic is found. One patient showed a definite intelligence deterioration very similar to general paresis. Two others complained of difficulty in memory and attention, which was not demonstrable objectively. Most of these patients come from a class with little or no education which, combined with a language difficulty, has made routine mental examination very difficult. Nevertheless, it is safe to say that there is no definite mental side to this clinical picture.

Time will not permit of a full report of all the cases we have investigated, and one must be content with a full report of one which was studied in the New York Neurological Institute:

R. B., 49 years old, born in England, married. Was admitted to the third division of the New York Neurological Institute on March 11, 1912. His family history was negative in every respect. His early history was uneventful. He denied syphilitic infection. Pneumonia in 1893. He has been married 28 years, and has had three children, all living and well.

He went to work in this mill, as a shift boss on the electric separators, in 1902, and in the latter part of 1904 he began to have trouble in sleeping, and would tire very easily. In December of that year he began to lose control of his hand in writing. The letters he made looked small and cramped. He was unable to make the figure 3. It would take him a long time to write out his reports, and they were not clearly legible. At about the same time he became unsteady on his feet, and had difficulty in walking downhill. When he started to walk downhill, he would get going faster and, finally, had to run until he could catch hold of a tree or similar object. Every time he tried to walk backward, he fell; he had no sphincter trouble. In March, 1905, he left the mill, on account of the trouble with his legs, and of the fact that he was coughing up large quantities of black matter. He continued to cough up much of this black sputum for one and one-half years after leaving the mill. For the first year that he was away from the mill his symptoms gradually progressed until he was almost unable to walk. His speech became affected, and his family had difficulty in understanding him. He stayed in this condition until the spring of 1909, when he began to improve a little. He became more steady on his feet, and his speech was more distinct. He has progressed very slowly since that time. At present, he gets around fairly well with the aid of a cane. He can not walk backward or go downhill without falling. His speech is not entirely clear, his writing is still small and cramped, and his memory is perfect; sexual power was preserved.

Physical examination showed a fairly well-developed man of 49 years, weighing 141 pounds. His face was somewhat masklike and expressionless, and he was unable to whistle. The eyes were entirely negative, except for a corneal scar in the right eye, resulting from an old injury with the iris healed in it. Dr. E. B. Dench made the following report on his ears: "The reactions of the labyrinth on each side and of each auditory nerve are normal. There was only an insignificant middle-ear condition. I should, therefore, place the auditory impairment in the reception center."

There was a fine intention tremor of the hands. All deep and superficial reflexes were active and equal. There was no Babinski or clonus. He showed a tendency to propulsion in his gait, which became marked when he went down an incline. He was unable to walk backward without falling. Asynergia was marked in all tests. No ataxia. The electrical reactions of the muscles of the arms and legs were normal in every respect. Sensation was perfectly preserved throughout.

The lungs and heart were negative, blood vessels soft, blood pressure 126 to 140 millimeters. Analysis of the stomach contents showed slight subacidity. The urine showed nothing abnormal except a considerable excess of indican. The blood was normal. No anemia, hyperleucocytosis, or changes in the differential count. Wassermann reaction of the blood serum was negative. The spinal fluid showed the following: Wassermann negative; globulin content normal; cells 3 lymph. per cubic millimeter; Fehling's reduction positive.

The course of the condition is chronic. None of the patients has gotten well. Most of them improve when removed from the dust, and especially from the magnet floor. Three patients have made very little or no improvement. The duration is a matter of years. The condition is never fatal, but the prognosis for recovery is extremely poor.

Only one of our cases has come to autopsy. He showed the symptoms in rather marked form, and died of pneumonia. I am very sorry not to be able to report the findings in full, but the material is not as yet ready for sectioning. Grossly, the brain and cord showed nothing abnormal. There was no arteriosclerosis of the larger vessels or any areas of softening. From rather superficial inspection of the brain stem blocks before embedding, it would appear that the perivascular spaces of the lenticular nuclei and the outer part of the optic thalami are considerably larger than normal. These are not unlike the "launæ" described by Marie in certain cases of cerebral arteriosclerosis. These are only mentioned in passing, as the author does not at present care to lay too much stress on them as of pathological importance. No gross tract degenerations were seen anywhere. There were no gross changes in the kidneys, liver, or spleen.

We feel that this series of peculiarly similar cases represent a definite disease picture, the cause for which must be found in the working conditions or the material which the men handle. It has been a problem to determine the real causative factor. Zinc, of course, was the one first thought of, but zinc has been regarded for years as a harmless metal in so far as its effects on the nervous system is concerned. Popoff[1] described a case of general muscular atrophy, with gastro-intestinal symptoms, in a bronze worker, which he ascribed to zinc, but it does not correspond with our cases. Tanquerel des Planches[2] considers that zinc never causes any symptoms. Edsall,[3] with an extended experience among zinc workers, believes that zinc never causes a systemic poisoning. Schlockow,[4] in 1879,

reported a peculiar disease which he had observed among some workers in a zinc mine in upper Silesia. The symptoms these patients exhibited were very similar, in many respects, to the ones we are considering here. There was marked intention tremor, but the most prominent symptom was gait disturbances, which he described as "stiff, hurried, and unsteady." Asynergia was certainly present. The reflexes were normal. The author considered it a disease of the spinal cord, due to zinc poisoning, although he had no autopsy material to substantiate his theory.

It is interesting to note that the ore taken from this mine in Silesia was not unlike that which our patients handled, in that it contained a considerable quantity of manganese, but there was also lead and arsenic in this ore, which possibly accounted for some of the symptoms Schlockow reported.

Feeling that zinc could not be blamed for this intoxication, one must next turn to the other principal metallic substance, manganese. The toxicology of this metal is little known, owing to its restricted use. Of all disease pictures reported in literature, none more clearly resembles the cases here presented than does that reported by Embden[5] in workers in a manganese dioxide grinding mill. He reported four cases which occurred in men who worked in an atmosphere of manganese dioxide dust. They showed general muscular weakness, but no atrophy; masklike face, with inability to whistle. The gait was unsteady and there was a tendency to fall forward, especially on going down an incline. Retropulsion was marked. All tendon reflexes were active and equal. There was a coarse intention tremor which in some cases made writing difficult. Voice was slow, unsteady, and monotonous. One case had impulsive laughter. There was no sphincter trouble. Manganese was found in the urine. These symptoms came on after the patients had worked a few months in the manganese dust.

It has been suggested that possibly the high power electromagnets among which most of these men have worked might play some part in the etiology of the condition. It is difficult to conceive of this as a primary cause, as there are other places where men work in high-power electric fields in which such a condition must have been observed long ago. However, when one considers that all but one of our patients developed the symptoms while working on the floor with the magnets, it must be admitted that possibly this factor plays an etiological rôle.

A final word on the absorption and excretion of the poison. Absorption takes place probably through the lungs. The density of the air dust makes it impossible to avoid getting the dust into the lungs. In all the cases there was a history of spitting up of dark sputum long after the patient had stopped working in the mill.

The fact that gastrointestinal symptoms did not occur in our cases probably excludes the absorption of the poison in this way. Of the excretion I regret that so little is known. The excretion of most mineral poisons takes place principally through the intestines, with the kidneys as a secondary channel. On one occasion specimens of urine were taken from four men working on the magnetic machine, none of whom showed any symptoms, and in each of the specimens definite traces of zinc and manganese were found. Four urines from other workers in the mill were analyzed and showed no trace of the metals. It was suggested that possibly in the magnetic field the manganese molecule was so altered that its solubility was increased. To determine this experiments have been made by shaking up the manganese bearing ore in rabbit's blood serum, both in the magnetic field and out of it. No difference in the solubility could be determined. To speculate on the question of why so few of the men employed in the work developed this condition takes one into the field of individual susceptibility, and thus far from the purpose of this paper. The conclusions the writer wishes to draw from this paper are:

1. That this is a definite pathological condition, recognizable by a definite symptom complex.
2. That it is a pathological condition of the central nervous system, affecting principally the mechanism of walking and equilibrium.
3. That it can not be placed under the heading of any known central nervous system disease.
4. That it is of toxic origin and, in greatest probability, the toxic agent is manganese.

DISCUSSION.

Sir Thomas Oliver regarded Dr. Casamajor's paper as one of a highly educational character. Like the reader of the paper, he took the view that the symptoms were due to manganese. Zinc is not known to give rise to any such symptoms as those recorded. It was interesting to observe that the lesion in manganese poisoning, if any existed at all, was in the spinal cord. The very fact that a patient during life had cerebro spinal symptoms suggests a toxic origin, even in a case where no anatomical changes are found at autopsy. Even in these cases, careful microscopical examination might reveal changes in the protoplasm and the position of the nucleus in the large multipolar cells of the central nervous system. It was interesting to observe that in the urine of the workers manganese was found only very occasionally. Although the dust entered the body by the respiratory channels, it was yet a fact, as Saito, a Japanese, had shown, that the bulk of the dust was found in the alimentary canal.

Dr. H. M. Harvey asked the number of men employed in the mine. Length of time in operation before the first case was observed. In what length of time did the mine cases develop. What methods were adopted, or recommendations made, to prevent this condition.

Dr. de Pulligny inquired whether this ore of zinc does not contain a rather high proportion of other toxic metals such as lead, arsenic, or even cadmium, to which the accidents observed could be attributed. The toxicity of zinc itself is generally questioned by the hygienists of the old world.

Dr. Louis Casamajor. I want to say that we have computed that about 2½ per cent of the men employed in the mill, for a period of over six months, in the last six years, have developed this condition. The condition was not recognized as due to poisoning until one year ago. Previous to this, the foremen in the mill had noticed that some men were unsteady on their feet. They would go along with a wheelbarrow all right, until they put it down, and then they would fall into it. One case was seen by a New York neurologist who said he did not know what it was. As the condition was not recognized before, no measures for prevention have been taken till lately. Now some of the men are wearing masks. If necessary the methods will be so changed that dust will be avoided.

I wish to thank Sir Thomas Oliver for his helpful remarks. There were no peripheral nerve symptom in any of our cases, except possibly the pains in the legs seen in a few of our patients.

---

[1] Popoff: "Ein Fall von chronischer Vergiftung mit Zinkoxyddämpher und Experimente über die Wirkung einiger Antifermentative Mittel." Berlin Klin. Wochen., 1873, p. 49.

[2] Tanquerel des Planches: "Contribution a l'etude des intoxications professionelles." Thésé de Paris, 1902.

[3] Edsall: Article in Osler's Modern Medicine, p. 138.

[4] Schlockow: "Ueber ein eigenartiges Rücken-marksleiden die Zinkhüttenarbeiter." Deutsch med. Wochen., 1879, p. 208.

[5] Embden: "Zur Kenntniss der Metallischen Vergiften.—Ueber die chronischen Manganvergiftung der Braunsteinmüller." Deutsch med. Wochen., 1901, p. 795.

EYESTRAIN AND OCCUPATIONAL DISEASE.

GEORGE M. GOULD, M. D., Atlantic City, N. J.

In 1910 the Census Bureau issued a classified list of occupations containing 410 pages. Duplicates and repeaters deducted, there remain "7,000 or 8,000 separate and distinct occupations." Classifications according to morbidity and mortality rates are therefore, for deducing lessons, almost impossible. One is lost in wonder at the recent unparalleled increase of new callings and of their ever-variant disease-breeding conditions.

Another glimpse of the same difficulty is given in the statistics of 120 general labor organizations and national unions in the United States. These, approximately, have 27,000 local unions, 4 departments, 39 State branches, 632 city central unions, and 668 local unions, all with a paid membership of about 2,000,000. The trade unions of Great Britain have a membership of more than 2,000,000 and an income in 1910 of $15,511,555. But the unions, of course, omit altogether the great masses of the country's population, so that, as a basis for judging the relative pathogenic rôles of the occupational conditions as a whole, we are without adequate data.

I have therefore, tentatively and crudely, grouped modern workers, union and nonunion, in such a way that we may roughly estimate the comparative incidence of a single pathogenic factor according to the nature and conditions of the labor. The five groupings of occupations are designed to indicate their rôles in creating or increasing the diseases directly or indirectly the result of eyestrain.

With one condition (later explained) in mind, the least eyestrain will, as a rule, be found in those workers of Group I, the most in those of Group V. From No. 1 to No. 114 eyestrain reflexes and diseases will generally be found to increase pari passu. The most common mistake of physicians and investigators is to forget the old fable of "the belly and its members," or the unity of the organism and the interdependence of its individual parts and organs. Hence the thousandfold and daily repeated error of considering symptoms manifested in one organ, as if it were independent and solely affected, while the cause of the disturbance really lies in some distant organ. Just as a poison in one part of the body morbidizes all other parts, as a lesion in a distant nerve or ganglion may affect a far and unlike organ and function, so may malfunction of the eyeballs beget disease in brain, stomach, spinal column—wherever, indeed, errant neural forces come into relation with movement or the world of circumstance and demand. It is an old fashion to ignore this old truth, but the fashion must change if our philanthropy is to be made real love of men and if our science is to be made really scientific.

GROUP I.

[40 per cent of population; 1 to 20 per cent have ocular or eyestrain diseases.]

1. Hunters, trappers.
2. Lumbermen, raftsmen.
3. Fishermen, oystermen.
4. Seamen, sailors, marines, Navy.
5. Ranchmen, herders, drovers, stock raisers.
6. Farmers, agricultural laborers, fruit raisers.
7. Common laborers, road and street makers.
8. Soldiers.
9. Teamsters, draymen, hackmen, hostlers, hucksters.
10. Policemen, watchmen.
11. Street-railway employees.
12. Foremen, overseers.
13. Gardeners, florists.
14. Packers of meats, fruits.
15. Switchmen.
16. Hod carriers, building and construction workers.
17. Railway trainmen, carmen, freight handlers.
18. Stationary engineers and firemen.
19. Quarrymen, ore men.
20. Locomotive firemen.
21. Locomotive engineers.

GROUP II.

[10 per cent of population; 20 to 40 per cent have ocular or eyestrain diseases.]

22. Sugar makers and refiners.
23. Hotel and restaurant employees and waiters.
24. Engineers (civil, mechanical, electrical), surveyors.
25. Railway conductors.
26. Domestic servants, cooks.
27. Laundry workers.
28. Roofers (composition, slate, tile).
29. Billposters.
30. Painters (outside).
31. Brick and terra-cotta workers.
32. Pottery and tile workmen.
33. Asbestos workmen.
34. Brewery employees.
35. Stage employees.
36. Butchers, meat cutters.
37. Pulp, sulphite, and paper workers.
38. Steel-plate transferers.
39. Marble workers.
40. Carriage and wagon makers.
41. Piano and organ workmen.
42. Woodworkers, curtain makers.
43. Carpenters, joiners, car makers, pattern makers.
44. Cement workers.
45. Merchants, salesmen, saleswomen.

GROUP III.

[10 per cent of population; 40 to 60 per cent have ocular or eyestrain diseases.]

46. Masons, stonecutters, bricklayers.
47. Printing pressmen, lithographic press folders, stereotypers, color mixers.
48. Plumbers, gas fitters, steam and hot-water fitters.
49. Machinists.
50. Painters (inside), decorators, paperhangers.
51. Lathers and plasterers.
52. Coopers.
53. Molders, foundry men, tin-plate workers.
54. Bridge, structural iron, steel, and tin workers.
55. Metal workers, iron-ship makers.
56. Blacksmiths, horseshoers.
57. Lead and zinc workers.
58. Paper makers.

GROUP IV.

[20 per cent of population; 60 to 80 per cent have ocular or eyestrain diseases.]

59. Housewives.
60. Professional invalids, asylum and sanitarium residents.
61. Bakers and confectionery makers.
62. Electrical workers.
63. Brush makers.
64. Hat and cap makers.
65. Boot, shoe, and leather goods workers.
66. Actors and actresses.
67. Upholsterers.
68. Glove makers.
69. Spinners, weavers, textile workers.
70. Saw smiths.
71. Garment makers.
72. Metal grinders, polishers, finishers.
73. Bookbinders.
74. Basket makers.
75. Tool and cutlery workers.
76. Pupils of public and private schools, below high school
77. Chemists, laboratory workers.
78. Musicians.
79. Telegraphers.
80. Boiler makers.
81. Broom makers.
82. Miners (coal, mineral).
83. Tunnel and subway workmen.
84. Compressed air and foundation workmen.

GROUP V.

[20 per cent of population; 80 to 100 per cent have ocular or eyestrain diseases.]

85. Students of high schools, seminaries, colleges, universities.
86. Clergymen.
87. Lawyers.

88. Bank clerks.
89. Lathe workers.
90. Clerks (commercial, post office, railway).
91. Wood carvers, lithographers.
92. Journalists, reporters.
93. Authors, literary and scientific workers.
94. Professors, teachers.
95. Barbers.
96. Stenographers, typewriters.
97. Draftsmen, designers, architects.
98. Physicians and nurses.
99. Artificial-flower makers.
100. Jewelry makers.
101. Bookkeepers, copyists.
102. Dentists.
103. Watch and clock makers.
104. Telephonists.
105. Engravers and photoengravers.
106. Cigar makers.
107. Glass blowers.
108. Sewing women and men, dressmakers, tailors.
109. Lace and embroidery workers.
110. Typesetters.
111. Cutting die and cutter.
112. Miniature painters.
113. Photograph retouchers.
114. Etchers.

The groups and the order given the occupations within a group have the value only of my guesses, made up from personal experiences with patients, supplemented by reading, and individual knowledge of medicine, industries, and life. The large percentage of the total population placed in Group I appears justified by the inclusion of the great masses classed as farmers, agricultural laborers, common laborers, soldiers, railway workmen. The school children and housewives greatly increase the total comprising Group IV.

Assignment of a person to a group, or to a particular place in a group, depends upon a number of considerations, the chief being—

1. The average distance from the eyes of the object habitually observed, and its size—the nearer it is, and the more minute, the greater the eyestrain.

2. The more constant this near focalization, the more severe the eyestrain.

3. With decrease of the illumination below a high physiological standard there is a geometrical increase of eyestrain.

4. The exposure of the eyes, during labor, to wind, cold, heat, dust, excessive illumination, and so forth, heightens their liability to inflammatory diseases, and also to eyestrain and its systemic reflexes.

5. In near work, such as reading, writing, and the like, an habitual abnormal position of the head or of the body may add enormously to the occular injuries and eyestrain.

6. The age of the workman may govern the degree of eyestrain. Without correcting spectacles, everyone has eyestrain after 43 years of age, especially in looking at objects persistently within "near range," i. e., at reading, writing, and handwork distances.

7. The synchronous cooperation of the two eyes is also an important factor. By mid-life, because of anisometropia, heterophoria, and so forth, one eye is often disused, amblyopic, or even blind. This trend emphasizes dominancy of one eye, so that this lessens eyestrain, which is the cause of the disuse of one of the eyes, but at the same time it adds to the liability of accident from the blind side, and also multiplies the dangers and handicaps of the worker in other respects.

8. Probably 6 per cent of children are naturally left-handed, left-eyedness causing left-handedness. The unconscious crime of trying to make a left-handed child into a right-handed one produces tragedy in the life. Many causes may also transfer the dominance of the coordinating eye over to the other eye, thus exposing the unfortunate person to many trials and dangers.

9. A peculiar axis of astigmatism, or the writing posture, may so cant the head and body to one side as to set up lateral spinal curvature, and bring the child to death's door because of vomiting, denutrition, and so forth. Correction of the refraction errors and the morbid posture in such cases would bring health. From 6 to 10 years of age many children show an incomprehensible "nervousness," chorea, fickle appetite, and various disorders, all usually due to eyestrain.

10. There is one qualification as to the constancy of the groupings, which, omitted, would confuse the investigator. It is the unsuspected eyestrain work which may be indulged in besides that of the occupational demand. A member of Group I, for instance, may be ruining eyes and health by novel reading, study, sewing, embroidery, or games carried on at night or during rainy or unseasonable weather. The light used may also be poor, and unshaded in front of the eyes. The habits must be studied to learn the truth about each individual worker and his proper placing in one group or another. I have known of hundreds of patients with health nearly or wholly ruined by eyestrain, who, by order of their physicians, and face to the light, were reading without spectacles and lying down, too, for many hours a day or so long as outraged nature would permit. Their diseases were thus increased by order of the hospital or sanitarium. The very latest reported cure for the diseases of eyestrain is knitting in bed without glasses, or with such as increase eyestrain, for six hours a day. The order should also have been "with one-half normal illumination."

Moreover, in patients with high refractive errors, unsymmetric astigmatism, or anisometropia, even distance vision is pathogenic.

11. It should also be added that the morbid results of eyestrain, never wholly absent throughout life, may begin very early in childhood, even in the second year. Many little children, for instance, are constantly tearing their clothes, hurting their feet and legs, stumbling, and falling, because their eyes are so faulty that the estimates of the size, location, and nature of objects, are not correctly made, and the proper muscular coordinations are so inaccurate that motility is erroneous and unsafe. Adults hitherto blind and suddenly given good vision, require years to learn to see with accuracy or safety in action.

Eyestrain is an unfortunate word, but we are compelled to use it. It is usually misunderstood to mean the overuse of a pair of optically perfect eyes. It should be defined as that use of ametropic eyes which is pathogenic, or productive of local or systemic disease. But measurements of human eyes demonstrate that there is not, probably, one pair in the world absolutely emmetropic. That would be a miracle which nature with all her infinite ingenuity has never performed. No human face, indeed, of the world's sixteen hundred million may be held perfect, either artistically or physiologically. To the owner of the face that is relatively an unimportant matter, but to the owner of the pair of eyes an error of one three-hundredth of an inch in the curvature or dimensions of the eyeballs may make their all-important function pathological, may even invalidate or end the life of the man or woman.

The highest differentiated of tissues of the human organism is the brain, and genetically the eye is the only organ made directly from cerebral tissue. The brain literally comes out of the skull in order to see. The eye responds to the smallest physical force in the world—that is, light waves are hundreds of millions of millions of times more infinitesimal than sound waves. The eyes are the hardest worked of all organs. The safety and existence of human lives frequently depend directly upon their accurate function, i. e., upon nonpathogenic action. All organismal motility is conditioned upon mathematically exact coordination with and dominance of vision in the motions and localizations of the hands and the feet, of external and distant objects. Ubi motus, ibi visus! The perfection of visual function requisite in civilized occupations of infinite variety and differentiation is thus seen to be necessarily wanting in some way or at some time of life. The startling truth comes to better recognition when we realize that in the past the entire complicated mechanism of vision was made and used almost solely for distant vision, while for the majority of its expert and educated workers modern civilization chiefly and increasingly demands constant and accurate vision at

near range. For this the mechanism does not exist, and the attempt to compel the function brings disease. Nothing of like importance is so appallingly neglected by medicine and hygiene.

This strange and unscientific neglect is explainable by the failure of investigators and physicians to recognize two physiological truths: Nature can not keep a muscle continuously innervated or contracted, and she can not keep a retina continuously sensitized during any protracted exhaustion by the image stimulus. Of the ciliary muscle of the eye, and for most of the working day, modern tasks command almost continuous innervation and contraction. So exigent is the taskmaster that the eyes are put to impossible tasks, from which result, first, local inflammation and morbidities of the lids, conjunctiva, and so forth, and, later, retinal congestions, myopia, iritis, cataract, and so on. Worse even than these are the systemic ocular reflexes, the morbid overflows and reactions of the cerebral telegraphic switchboard. There is a long list of these cerebral and mental diseases, the vast majority not caused by organic disease of the brain, and due solely to the morbid reflexes of eyestrain—"nervousness," tics, choreas, neurasthenias, epilepsies, and especially the interminable list of headaches and migraines—with or without giddiness, swoonings, or faintings; exhaustion and morbid psychic effects; diseases of memory, such as losses of self-knowledge and subsequent findings of self far away with sudden coming back of memory; so-called Meniere's disease; the functional stomachal and digestional diseases with persistent vomiting, anemia, denutrition, and so forth. Lastly, to swell and complicate the horror, between 80 and 90 per cent of the school educated have lateral spinal curvature, which is largely of ocular origin.

All these amazing sins of unhygiene are almost wholly preventable by two simple devices—by scientific spectacle lenses and by physiological posture of the head and body, especially during writing, study, and like occupations. This correct posture may only and chiefly be secured by the sharply slanted school-desk leaf and proper position of the writing page and book and the correct placing of the hand. The spectacles may be obtained only by great scientific care, and when science and philanthropy are united. The morbidity rate will then be several times reduced and the mortality rate at least halved.

Although the order of the groups was not designed to illustrate one thing, it nevertheless does make manifest a noteworthy fact: The production of eyestrain by recent civilization. The first group includes most of those occupations dominant before the invention of printing. In the last group they are almost solely made up of the most differentiated or specialized callings of the latest civilization required by learning, literature, printing, sewing, telephoning, and

their ancillary crafts. Intimately correlated is the fact of urbanization. Eyestrain increases pari passu with work at near range—i. e., according to the amount of work done inside of houses—and the modern growth of population is largely taken up by the town and city. Some part of this evil is offset by the invention and popular use, in the last few years, of glass windows—the greatest of all discoveries as regards health. And almost as valuable is the better artificial illumination of our time. The rush lights, lard lamps, and tallow dips of our forefathers and foremothers were prolific sources of ruined eyes and health. In India to-day cataract is for this reason vastly more prevalent than with us.

Civilization thus necessarily lessens the numbers in the lower or first groups. All civilization depends upon increased use of the eyes at near range. Group V is thus steadily absorbing the members of the lower groups. There are, indeed, a small number in Groups IV and V who are really going back to preceding groups by a sort of vicarious atonement. For instance, heads of business enterprises and of various institutions, and many professional men, now employ stenographers, research workers, clerks, copyists, even authors and bookmakers. These come up from lower groups, and take upon themselves the ocular reflexes of their employers. Machinery is also lessening the number of employees of the first four groups, and, in the differentiation of function and systematization of many businesses, the same fact appears. Urbanization itself increases the number of sedentary or eye-straining occupations. The school children and students, with the sharp general increase of the number of the educated, coupled with the amazingly vast output of the printing press—these and various other similar habits add to the evil.

The great truth I am seeking to bring into evidence is that civilization itself is the direct and indirect product of vision—its absolute sine qua non. Language, the very letters of the world's one alphabet, memory, the processes of sensation and of thinking—crede Bergson—the existence of science—whatever elements of modern life are basic, all are the products of picturings and the epitomes of images, systematizations, and utilizations of the acts of vision. Every advance in civilization is dependent upon greater precision and increased strain in near-range vision. There is thus the progressive moving up of the members of each group from the lower to the higher, and a rapid increase of the percentage of Group V. The added fact that, in the vertebrata, all useful actions, all motilities, all muscular actions and coordinations, have depended upon vision—vision, both as incitor and director—shows that the whole fact and course of animalian and human evolution has been dependent upon vision, and is largely the product of vision. The exclusion of the unfit and the survival of the fit has been and is rigidly conditioned upon the inheritance of

the best eyes and the highest accuracy of function of the eyes. It should be recognized that the pathological functioning of an organ has for the organism the equivalent of ill which its physiologic function has for good, or for service. The pathology, i. e., the ill health of civilization is, in truth, largely due to the pathology of vision. Learning to see, and to coordinate vision and muscular action with precision and lightning-like rapidity, require a long and difficult apprenticeship. It absorbs at least a dozen years of the child's life. If handicapped by ametropia, the result is never good; with many defects, it is so imperfect that it begets constant pathologic results to both eyes and organism. As to the millions of common school children, their ocular ills, their eyestrain, and its effect upon general health, their standing in classes, the reasons for the dullards and truants, and even juvenile criminals—of all this big book of human ills and wrong, we are now at the opening page. The headings of the chapters on lefthandedness, spinal curvature, and the writing posture have been written, but not one good school desk exists in the United States, and every child writes with body and head and eyes in disease-producing postures.

There are three sources of sickness. Either the workman's body or mind brings it with him or his job and its conditions supply it; or, lastly, it is due to far-coming infection. We now know that the seed—infection—is of comparatively little power or significance without the conditioning and prepared soil. The latest word, moreover, of medical science—immunity, or immunology—shows that the best way to meet infection is by the inherent and strengthened ingenuity of wise life to fight the invading foe in her own sacred home and country. We are thus practically limited to two sources of our morbidities. Disease is either brought to his occupation in the body of the worker or the occupational conditions beget it. As scientists and hygienists, we exist for the prevention of disease.

But in its early stages the ontogeny is simply the epitomized result of phylogenetic action and reaction in the infinite evolutionary past, and it is therefore but little subject to the temporary influence of individual therapeutic effort. Moreover, the later the parental links of the phylum the less this modificatory power over the ontogeny. Effective therapeutics therefore resolves itself almost wholly into late and cumulative ontogenetic modifications and resistances following environmental changes. Whether these characters are called "acquired" or not, and whatever may be the definition of "acquired," matters naught to one who fixes his attention upon real facts and effective function, instead of upon theories and definitions. The thought which brings clearness into the discussion is this: The longer the phylogenetic history and the more differentiated the ontogenetic tissues the less the reaction to and modification by cir-

cumstances. The plant which, taken from low levels to mountain heights, lives by sudden and extensive modifications of structure, has little to teach the highly differentiated ontogeny called a man. He must prevent sickness and preserve life largely by the artificial helps of civilization and science, instead of by crude structural changes.

The conclusion thus becomes clear that environmental injuries may be prevented, neutralized, or overcome in three ways:

1. By our conscious and designed environmental changes made possible by civilization, through devices, new mechanisms, and controlled conditions. By experience and instruction the workman may be taught to avoid his reckless occupational poisonings; machine holing will bring miners' nystagmus to an end; glass blowers' cataract is unnecessary; most infectious and parasitic diseases are conquerable by hygiene, almost by simple cleanliness alone; poisonings by work in lead, brass, mercury, and so forth, may be easily avoided; eyestrain is prevented by scientific spectacles; and so on through the list. When once combined and in earnest, hygiene, civilization, and philanthropy will largely extinguish occupational disease by such protective modifications of conditions. Already the life length and health secured by modern clothing, housing, glass windows, artificial illumination, progressive farming, transportation, and so forth, have enormously added to the number of lives and to the average length of life of civilized peoples. The ametropic eyeball, e. g., can not be made emmetropic, but the ametropia may be neutralized by lately devised optical lenses.

2. By increasing, through artificial immunization, the natural or acquired resisting powers of the body against infection.

3. By slow and cumulative reactions, functional, cellular, or structural, foreseen by eugenics, against harmful environmental influences. This cumulative modifiability in phylogenetic development has been the mechanism of the origin of species and of filling the world with life.

The abiding result, either of simple observation or of the most inclusive scientific generalization, the one great miracle of all life, is this amazing success in the intelligent adaptation of long lines of inheriting organisms to an infinitely varied and continuously varying environment. These diverse life forms and the origins of species are simply illustrations that the origins of disease may finally be neutralized or overcome. This is the glory and the success of rational as distinguished from empirical therapeutics, the task of preventive instead of curative medicine. Pathogenesis being thus due to the failure of reaction of the organism, it follows that the occupation may be freed from its apparent morbific effects, either by the hygienic suggestions of the hurt organism, or by overcoming and preventing the hurts through its own self-evolved variations, obviations,

adaptations, resistances, immunizations, and victories. Temporary sicknesses—functional diseases—are the passing failures of the organism to react successfully; organic and lethal diseases are the ingravescent failures or postponements of death; and death itself is the final acknowledgment of utter failure to react successfully.

What disease-breeding factors and powers does the worker bring to his occupation? It is self-evident that, except infections (and even here the organism supplies the most important help, the soil), all organic and lethal diseases (omitting the disease anno Domini, or utter senility), have their sources in abnormal or aberrant physiology. The pathology which is rational, and motived upon philanthropy, asks simply about the precedent pathogenic and curable functions that begot the incurable disease. They are the causes of the lethal diseases, death, as we have said, being the confession of the individual inability to adapt the organism to the environment. The command is, therefore, to stop the late and incurable diseases by the prevention and cure of the functional diseases. In eyestrain this is amazingly possible. Now, there are a hundred types of these preventable functional diseases. But their ultimate causes are not so many. Our world, for instance, is crazed and sickened by morbid habits, by alcohol, by tobacco, by sugar and candy, by luxury, by narcotics, by venereal disease, by pseudoliterature, by pseudoeducation, by egomania, by sin, by the lust for power and wealth, by concealed crime, by faddism, by monotonous drudgery, by diseases the prevention of which or the causes and cures of which are known but ignored, by hopeless poverty, by the haunting horrors of insanity, suicide, and approaching death. The chief and most prolific of the list is eyestrain, but its known rôle and certain prevention are sadly neglected.

Up to the present time the recognized occupational diseases of the eyes have been few in number, the etiologies indefinite or erroneous, the prevention and therapeutics either mere makeshifts or unknown. This was because the physiology of vision was not understood, the facts and causes of eyestrain unrecognized. Many years ago, for example, with little search, I found all about me large numbers of albinos. The results of the study of these cases were most inspiriting to me, but to nobody else. There may be 100,000 such patients, or should-be patients, in the United States. Their tragedy is solely ocular and wholly due to nonpigmentation of the irises. The whiteness of the hair has no significance. Because of the semitransparency of the irises, the entire retina is flooded with half light, and thus the image is not sharp or accurately delimited by shading. The retinal sensitiveness is so exhausted that great amblyopia follows, and, to find new and sensitive retinal areas, a constant nystagmus naturally replaces the steady fixation of the image upon the

macula. It was an inevitable and saving way of making the best of a bad bargain. The palpebral aperture is also habitually narrowed in order to exclude the peripheral rays of light, and the cornea is thus crushed by the lids into enormous astigmatisms at axes 90°. The correction of the astigmatism, while not curing the chief cause of misery, would bring wonderful relief to the albino from the worst effect, and would multiply his abilities to overcome his pitiful industrial problems. Except as a farmer—and a poor one—he is now shut out of almost every ordinary calling. The poor image not bordered by darkness, which is the real source of the evils, could be stopped by early and constant use of colored or smoked toric lenses with small transparent ametropic lenses inserted in the centers.

The study of albinism would have taught the needed lesson as to the etiology of the nystagmus of the " holing " coal miner. Its cause is said to be due to the position of the body and head of the miner in holing and his looking upward.[1] I think this looking upward has little or nothing to do with the origin of the disease, because the nystagmus of the more numerous albinos could not be from such a nonexisting cause. I have watched miners at holing, and there was no looking upward, the horizontal body and head not possibly being lower than the point of impact of the pick. The real cause of the miner's nystagmus is, I think, the same as that of the child with anterior polar, or any central cataract. It consists of the insufficient and pathologic illumination of the retina by the object gazed at. The bare flame of the wretched lamp is also often in front of the eyes. There is also quick, tense closing of the lids to avoid corneal injuries by the darting bits of coal; this increases astigmatism, amblyopia, and eyestrain generally. The change to machine holing will end miner's nystagmus.

The cataract and the ocular diseases of glass blowers are explainable in similar and natural ways. As asserted by Halfort in 1845, ordinary or senile cataract is caused by eyestrain—that is, by ametropia and presbyopia—and is preventable by scientific spectacles. The glass blower subjects one of his eyes to great light and heat in looking through the furnace opening at the molten glass. His gaze at the glowing bulb also increases the corneal warping, the retinal and lenticular inflammation, ametropia, denutrition, with consequent loss of transparency of lens, and cornea. Properly ground and smoked or colored lenses (over the furnace opening also) would certainly prevent these evils. The ametropic correction, also united, would cure much or most of his " indigestion and dyspepsia," now charged up to " unhygienic food and habits," but in scores of other callings found to be due to eyestrain.

Even when the sources of some of the workman's diseases are more plainly due to poisons, almost all authorities continue to ignore the agency of eyestrain in producing or increasing symptoms which we now recognize are caused by eyestrain. Many writers seemingly have never heard of "asthenopia" (the ancient of eyestrain), much less of astigmatism. Others find that the action of dust has no relation to ocular disease; at least, it is ignored. Even needle-grinder's eyestrain to them suggests lung trouble only. The high-water mark is reached by one reporter who, in 1892, ridicules the idea that congestion of the choroid, asthenopia, cataract, and blepharitis may be caused by diamond cutting, jewelry making, and similar pursuits. He therefore applies to the senior surgeon of the local eye hospital of the city where engraving, jewelry making, fine metal work, and diamond cutting are extensively carried on. The ophthalmologist answers that the eye affections in these trade workers "are those in which some optical defect exists, especially hypermetropia and astigmatism." The workers suffer from diseases of the choroid, retina, conjunctiva, and lids. "But, in their case, it is not the work, but the unfitness of the eyes for the work, which is to blame." "On the whole, I should say that fine work, even when regular and persistent, does but little if any harm to normal eyes." Such hygiene finds that ill-ventilation accounts for the high mortality of typesetters and printers, and so forth, and so on. What is "a normal eye," and where is the emmetropia, which is wrongly taken for granted, the rule?

Most suggestive are the three reports concerning telephone operators issued in the United States, in Canada, and in England. There are in the United States about 125,000 telephone girls whose average term of service is three years or less. The working hours are about eight per diem; the average number of calls is about 140 per hour, running, "at the peak," to "the breaking point of efficiency," 225 or more. The Bell system seems to be trying to do its duty as regards the health of the girls, but there is no evidence that it has secured expert medical advice, and, especially, in ophthalmology, the most important of all. The company in 1911 spent $720,953 for rest rooms and lunch rooms for the operators, and it has secured sufficient air space and good illumination. Despite these things, it is a startling fact that, although only young and healthy girls are selected, the average length of service does not exceed three years, and may be less. The symptoms mentioned are headache, dullness, indigestion, exhaustion, nerve strain, insomnia at night, but with daytime sleepiness, colds, and so forth. Medical medievalism resurges in "blood surging to head and arms." Equally absurd is the emphasized nonsense that the effort of reaching upward and sideways "to plug in the farthest jacks of the switchboard constitutes the physical elements of strain." Fully as antique is the statement that "constant

reaching to one side seems to increase spinal curvature." With this is to be read the fact that most of the reaching and hard work is with the right hand and arm, so that the woman with spinal curvature, "be it ever so slight," "should be kept out of telephone work." The etiology of lateral scoliosis is thus seen to be as unknown as its nature, its cure, or its prevention. The truth, of course, is that if the lumbar curve is to the right, reaching and bending to the right would lessen or even cure the disease—"be it ever so slight." Reaching upward, which is so diligently bemoaned, would surely be a hygienic blessing, be it ever so frequently done.

The intolerable fact that stares at one from every page of the United States report is that not the slightest hint is given that the two or three short years of telephone labor possible to the girls, and nine-tenths of all their awful suffering and wrecking, is due to constant near-range eyework without scientific spectacles. The demand —encouraged, to be sure—of the girls for "hot coffee," especially at night, is a pointing finger to the road down which millions are hurrying toward "the deep sea."

The report of the Royal Commission of Canada is somewhat more enlightening, because physicians from the University of Toronto were called to give their testimony as to the illness resulting from telephone operating. These gentlemen testify that the following facts, conditions, or diseases exist—I quote their words:

Reaching upward injuriously affects the nervous system.
Nervous debility.
Faces showed indications of weakness on account of strenuous employment.
Eye, ear, and throat all strained.
Nervous hysteria.
Constitution and nervous system injured.
Wearing down of the nervous system.
Optic and auditory nerves strained.
Debilitating to the nervous system.
Girls burn up more energy than they produce.
Most exhausting of all occupations.
Injurious to eyesight.
Produces headache looking at the holes.
Prevents rest.
Can not sleep when they go home.
Couldn't eat well.
Reaching is hard and injurious.
Eye troubles, headaches, and nervous troubles.
Affects the eyes, and, through the eyes, the general system.
The most trying of occupations.
Throat, chest, and nervous troubles, and headaches.
Nervous prostration and nervous breakdown.
After three years, unable to satisfactorily perform the ordinary occupations of womanhood.
Fainting.
Strain on nervous system through eye and ear.

Nerve fag.

Nervous exhaustion.

Strain upon the optic nerve and the muscles of the eyes.

Saw difficulty in fitting the plug in; they seemed to scrutinize it closely.

The nerves governing the extraocular muscles which focus the eye upon the object looked upon are the nerves where the greatest part of the strain comes.

Reaching added to the physical fatigue.

When they leave they turn out badly in their future domestic relations.

It is this sort of thing that is laying the foundations of the asylums, and it is dealing with the question now that will prevent the building of asylums and the loss of people to the community.

Not so much physical, as mental and nervous, and exhaustion of nervous energy, a depletion of nervous force.

The reason for such a marked increase in insanity and nervous prostration all over the country.

After five years she would be disqualified to become a wife and mother.

On future generations the effect will be epilepsy and all sorts of nervous diseases.

In other words, brave statements of facts and end results, with no recognition of the single cause, ametropia or eyestrain, from lack of scientific spectacles. In all households, in every occupation, in the thousands of hospitals, sanitariums, and homes, are millions of sufferers with the identical diseases, caused by near work without correcting glasses, in every and any occupation.

But there is here, at least, a glimpse that the numbo-jumbo, "fatigue," has a cause; that it has no significance per se; that it is not physical in nature, but nervous; and that it is not the fatal malevolence of the nature of things, beyond investigation and beyond thought of prevention, except by lessening the hours of labor. It must be so helpful to the laborer to tell him that he is fatigued, and that he must work only half the usual number of hours.

"Just as we are going to press," in the language of the happy editor, comes the English parliamentary report of the committee of medical officers concerning the condition of working of telephones. At last the discovery made by Halfort 67 years ago, rediscovered by Mitchell nearly 40 years ago, and again rediscovered by Savage 30 years ago, is once more being rediscovered to-day, and every day.

The English report does not say that the neurasthenia is caused by the work, but that this, with the anemia and neurotic tendencies, were brought to it by the worker. "Errors of refraction," it is stated, "became manifest by the nature of the work." The medical officers are advised to exclude candidates "showing pronounced signs of nervous instability or anemia, and of insuring that candidates suffering from hypermetropia and astigmatism have those defects corrected by proper glasses. The committee found that 142 out of 248 operators examined had had their health impaired by the "nerve and physical strain." "On a busy morning there is hysteria, as the girls get worked up," and the words "shivering and pant-

ing," "sobbing and crying" are used. "One girl fainted four or five times running." Another said, "Glow lamps are very trying to our eyes." "Dr. H. said that telegraphy got into my body (nerve storms); I used to twitch all over." One "thinks sight is affected by the boards being so close." "Miss ——— was on sick leave for three weeks from neuritis." "Switchboards are so close, great strain to eyes," testifies an operator. "Eczema of arm and abscess of ear." Such are some of the many items noted. The average annual sick-leave absences (London, Manchester, and Liverpool) steadily grew threefold in 10 years. In one year, the diseases listed in the sick room patients attended to were these, and in the following order: "Faintness, headache, indisposition, biliousness, hysteria, neuralgia, colds, and miscellaneous." The number of patients in the year, taken by months, March to March, were, respectively, 51, 106, 91, 103, 121, 146, 108, 107, 153, 140, 171, 138, 97, a total of 1,532. It is found that, generally speaking, the strain upon telegraphers and telephonists is about equal in degree. The disorders most frequently mentioned and most emphasized among the telephonists are "nervous affections, digestive disorders, anemia, nervousness, neurasthenia, nervous disorders, nervous debility, migrain, headaches, vertigo, palpitation, and so on, precisely those I have found in thousands of patients, and, for 20 or more years, have demonstrated to be due to eyestrain.

In Norway the report is that of 390 women there were in 1 year 11,621 days of sick absence, many because of diseases now recognized as due to eyestrain, distributed as follows:

Bronchitis, laryngitis, influenza	2,482
Gastritis, enteritis	2,324
Neurasthenia, cephalalgia	1,990
Anemia, circulatory, and blood troubles	1,705
Affections of sight	651

According to the English report, in Belgium the "physical conditions required for admission as telephonist" are peculiarly interesting, because they indicate some beginning glimmerings of recognition of truths concerning eyestrain. The principal duty of the Belgian examiner seems to be the long, exact, and useless "verification of the chromatic sense by Prof. Holmgren's method," ending with an accentuated "N. B.—Correct chromatic sense is not required of telephonists." However, "normal clearness of vision" is the chief requirement, and, mirabile dictu, "the test is applied to each eye," and "spectacles may be used in the tests." "A myopia of 6 D. may, at most, be allowed," if the visual acuteness is good; and hyperopic lenses "of any strength" are permitted on the same condition.

The report is a carefully guarded one, by silence or cautions refraining as much as possible from crediting illness to eyestrain, but

the dawning truth looks out at one from between and behind the lines. Some other callings are certainly more health wrecking than that of the telephonists, those, e. g., followed by musical composers, literary workers, sewing women, and so forth. It is gratifying to know that a host of nervous and digestive disorders may soon be recognized as originating in eyestrain.

The trials of the telephone girls illustrate the eyestrain results of new callings of civilization. There are many such novel industries appearing. A friend assures me, for instance, that men who run elevators or lifts are subject to novel eyestrain diseases. Typewriters, retouchers of photographic plates, machine printers and rulers, and wall-paper printers may also be mentioned.

The fundamental principle in deciding questions of the interrelation of eyestrain and occupation was first stated by Adam Smith—the proportion that the number of workers bears to the number of nonworkers. This seems to concern the production of wealth alone, but in its implications and necessary extensions it warrants most important conclusions. For the ability to work, or the disability, means much, means everything, to the worker and his family. All these, moreover, who die too early or who are turned over to institutional or private charity to support for the rest of their lives, these of course are among Adam Smith's nonworkers. The students of occupational disease do not seem to have kept Adam Smith's statement in mind. The very death rate and length of life are still largely determined by morbidity or by loss of serviceable vision. The habits formed in the dark ages, when incapacity for work meant death, are still present. When presbyopia came at the ages of 42 and 43 the worker in many callings had to stop, and had soon to die. For six years, beginning at 43, there were 60,000 more deaths in 100,000,000 born than in the six preceding years. The pensioning systems of our times often only prolong the uselessness of old age and continue a preventable senility. Instead of establishing pensioning systems we should at least do what is easily possible, provide suitable and beneficent occupations for the superannuated. Despite sentimentalism and false charity, there is not a blind person, for instance, who can not earn, or be soon taught to earn, his own living and be the happier for it. Many blind mechanics are making good livings [2] in a hundred diverse callings, to the shame of "tin-cup men" and street beggars, if to these, indeed, shame were possible.

The oldest treatise I have found on the subject of industrial diseases is that of Halfort, published in 1845, and entitled "Enstehung, Verlauf, und Behandlung der Krankheiten der Künstler und Gewerbetriebungen." It is the first time that Artizans (whose labor is so greatly ocular) are thus emphasized as being so decidedly subject to occupational disease.

Concerning straining of the eyes in industries, the author speaks of the now forgotten truth that the eyes are the most delicately constructed and noble organs of the body; he emphasizes the reasons for such strain as follows:

1. By long-continuing looking at small objects, mentioning especially watchmakers, typesetters, embroiderers, lacemakers, miniature painters, manuscript copyists, engravers, and so forth.

2. Work with harsh colors, or upon highly illuminated objects.

3. Labor under poor or fluctuating illumination, such as by flickering oil or candle lights, and, if long continued, even with good lights.

4. Sudden change from darkness to light.

The diseases resulting from these abuses are thus listed:

1. Shortsightedness from work on minute objects.

2. Inflammation of the external parts of the eyes, and, later, of the internal parts, leading to loss of vision and cataract.

3. Visual deterioration, amaurosis, deep-seated pain of the eyes, more frequently intense headache.

Spectacles and hygienic precautions are recommended to obviate the foregoing ills. The nervous irritability of yarn spinners is emphasized. And there, forgotten or ignored, this wise old observer is left.

There are not a few encyclopedic and erudite epitomes of the subject of industrial ocular diseases. All the local ocular diseases of every class of workmen are set forth from many points of view. But what is of value to the physician and hygienist, profoundly solicitous to prevent the evils, is almost entirely omitted. No ophthalmologists are quoted or referred to who are on record as to the eyestrain origin of either local ocular or general systematic diseases. Poor old out-of-date Halfort (1845) is wholly forgotten. The same diseases are listed as produced by a few diverse callings, regardless of the fact that they also exist everywhere and in every occupation. It would appear that, to avoid ruination of the eyes by ocular disease, all occupations must be given up. All industrial folk, for instance—it would take pages to enumerate the callings—are cursed with nervous, nutritional, and digestional diseases; but the same fatality persists in the majority of others who are not in such occupations. Eyestrain is never alluded to. The real and amazing rôle of presbyopia in every calling or noncalling is forgotten, although in all those working in lead, zinc, quicksilver, gas, and scores of other industries, the limit of industrial capacity is placed at about that terrible eyestrain year, 45. This unexpected and uncomprehended result suggests nothing to the writers. The height of inconsideration is reached in the official tracing of myopia to a multitude of causes, but never to the true cause, uncorrected hyperopia, astigmatism, and anisometropia.

With dogmatic ruthlessness myopia is called a disease—a disease not at all preventable by glasses correcting the error of refraction—an untruth fraught with tragedy to millions. But swift, safe, or accurate sport or bodily activity, except swimming, is impossible to a high myope. He never dares to run, and all motions must be slow, indefinite, and cautious. He has a stealthy, catlike step. In long tables the greater incidence of eyestrain diseases, according to calling (as in my groups), falls precisely on those doing the greatest amount of near work with the eyes. Amid all these writings there ever jumps up the hideous jack-in-the-box of weird diseases that afflict millions, but which fit into no accepted theory—"neuritis," "rheumatism," migraines, headaches, nervous disorders of a hundred kinds—the miseries of half the world and the mysteries of the whole.

Take a single example of many: The German State insurance department has established sanitaria for the treatment of insured working people who fall ill. The expenses trebled in three or four years, in 1907 amounting to $3,796,575. The workmen, it is naively said, "are eager for this medical treatment, rest, food, shelter, clothing, sanitary surroundings, and care"—such a wholly unnatural finding! A deeper insight into actualities is given in this little table of the working days lost by patients at one of these asylums:

	Men.	Women.
Infections	60	373
Poisonings	1,259	.....
Malnutrition	2,773	7,861
Skin, muscles, joints	5,177	953
Nervous disorders	44,965	25,075

Thus, nervous diseases alone caused nearly four times the number of lost working days as resulted from all other diseases combined. The wonderful word "neurasthenia," for a more mysterious and uncaused disease, increased from 18 per cent in 1897 to 40 per cent in 1904. "No difference as to clinical appearances exists between the neurasthenic workmen and the neurasthenic patient of any other social class" is a line of text that suggests, unconsciously, a volume of exegesis. The conclusion is that anemia and neurasthenia are due to "the monotony of work." The physicians of these sanitaria unanimously emphasize the enormous increase of the phychoses, nervous disorders, insanity, and especially of neurasthenia. A word or two is allotted to the part played by the eye, of course, and that eye labor "irritates the optic nerve," illumines abysmal deeps.

Another study takes up the question of fatigue, in which the conclusion is reached that fatigue itself is the great end and danger of occupation. "The neurasthenics of labor," "the self-generated poi-

sons of disease," "the disturbances of metabolism," are offered as the pathogenic factors. A thousand articles written by reputable and earnest physicians are not even referred to, because they give evidence that the etiology of these enormously increasing neurasthenias and other nervous disorders is clear and prevention possible. The therapeutics offered lead to one and only one measure—limitation of the hours of labor. Fatigue, as an explanation of occupational diseases, obscures instead of explains. The difficulty of understanding the causes and of eradicating the evils of such diseases is increased. Fatigue, indeed, per se, differs absolutely from disease. Even if so, how pay these workmen the same as for the present number of work hours? The employers of all nations, civilized or not, must of course give the same added wages; because, of course, the nation that gave the higher wages, without such utterly impossible agreement with all others, would speedily bleed itself to death. One would not be heard who persisted in his protests that the use of the eyes at near range is the now well-known dominant and predominant cause of all these named and misnamed nervous diseases so portentously ingravescent in all modern society. What is also more profoundly active in producing fatigue of the workman than ignored lateral spinal curvature, present in 83 per cent, from adolescence to old age? "Neurasthenia," "migraine," and a score of other diseases are neither uncaused, incurable, nor unpreventable. They are caused by ametropia, curable up to about 40 or 45, and always preventable by scientific spectacle lenses.

As to accidental traumatisms, similar misconceptions are met everywhere. Not even the corneal injuries of stonemasons, emery-wheel grinders, miners, and machine-shop workmen by "foreign bodies" are, it seems, preventable. Even simple plano lenses would stop the wounds and the losses of transparency, and if the ametropic corrections were incorporated many eyestrain diseases would also be obviated. Nowadays the worker with "a foreign body in his eye" is backed against the wall and with knife or pin the speck is picked or dug out by some fellow workman, often with lasting injury greater than if the foreign body were left in situ. Obviable, most all of this, if the workman was instructed in the deft use of a simple wisp of absorbent cotton.

Another fact which is beginning to appear in some of these reports and tabulations is the liability of one eye—usually the left, of course—to be hurt or to go out of use. A few Americans only have asked or understood why. The existence of righteyedness or left-eyedness and their relations to righthandedness and lefthandedness will not, alas, be soon recognized!

All the great treatises on industrial diseases do not even allude to the occupations of the majority of the inhabitants—those of in-

fants learning how to see; of kindergarten children working at near range with fine geometric patterns; of common-school pupils; of seminary, college, and university students; of writers and devotees of learning; of farmers, "hands," and peasants; of housewives; of sailors and soldiers; of the leisure classes; of millions in asylums, hospitals, sanataria, institutions, and prisons; of the senile who do not work; of the unemployed; of craftsmen, such as carpenters, masons, and builders in northern climes during winter; of men not laboring during rain, and many such. Nonoccupation may bring on the same diseases, or even worse diseases, than occupation, especially if near-range vision is forced.

A concrete illustration serves well, i. e., the etiology of myopia. In a country school near Munich, the highest class showed that 2.6 per cent were myopic, of the city school the percentage was 9.8, while of those ready to enter the university 55.9 per cent were near-sighted. So far back as 1866 the number of myopes in the University of Breslau was 60 per cent, in 1890 it was 59 per cent, and in 1902 it was 60 per cent. If myopia is a nonpreventable, causeless, incurable disease, as great and good scientists repeat, then there must be some reason for the statistical differences in our country, since with us the number of myopes is not so great, and we hold a very different opinion concerning the fatality of the disease. The official examination by Dr. Dresbach of 2,484 entering freshmen of Cornell University, demonstrated that 87 per cent were hyperopic, while the percentage of myopes was only about 8. And these results, too, were obtained without the use of a cycloplegic. The work of Risley, which fully and clearly showed the etiology and the preventability of myopia, has long been before all writers and students—before all who wished to see it and know it. Although writing in 1895, the great English oculist, Simeon Snell, accepts Risley's philosophy of the origin of myopia. No; myopia does not exist by the will of God or the fiat of fate; it is not, properly speaking, a disease at all, or, if so described, its origin is known and its preventableness certain. It is caused simply and solely by uncorrected, by overcorrected, or by miscorrected hyperopic astigmatism. There need not be a single myope in the civilized world, and there will not be one when the world becomes genuinely civilized.

The effect of pathogenic illumination in factories, workrooms, schools, and other places is a puzzling one to many investigators. They do not know what to do with the question, and the effects of bad lighting, if any do exist, are noted with peculiar vagueness, and the recommendations made are still more vague. But, in the recent Massachusetts report of the State board of health, it is said:

> It is a well-established fact that either the overuse of the eyes or the use of eyes under bad conditions may give rise to eye fatigue or to eyestrain, and many

eye specialists believe that at least 80 to 90 per cent of headaches are dependent upon eyestrain. * * * It is impossible to ignore the probability that many individuals working by gaslight, or even by electric light, in dirty, unpainted, overheated rooms, with impure air and excessive moisture, for 10 hours a day, or merely for the last two hours during the day, use up a great deal of nervous energy and suffer from eye fatigue or eyestrain and its consequences.

Forced and "cabin'd, cribb'd, confin'd," as the official admission is, it is nevertheless the frankest and best so far obtained. Of one factory this report says:

In many rooms the windows are too far apart and the light is barely sufficient, even in good, clear weather. The older weavers complain of failing eyesight, due to working with poor light.

It is indeed promising that this much of attention to the illumination of factories is at last given in this American report. But the sober second thought brings the caution that the illumination in the home room of the examiners was, at best, decidedly poor, as they themselves say of so many factories. Omitted entirely are the great governing principles, that the correction of ametropia is the most important of all prerequisites to avoid eyestrain; that poor illumination quadruples all eyestrain; that no tests of measurements whatever of physiologic and of pathogenic illumination are proposed or dreamed of (as if photometers had never been invented); that the agencies in creating and doubling poor illumination (never good in any factory in the world) of clouds, dirty windows,[3] rain, fog, darkness before sunrise and after sunset, wretched artificial lights, and more than all, the smoke nuisance. These, and many other similar conditions, should have been emphasized. The committee seemed to think that the chief hurt of poor illumination is to the esthetic sense of the factory workers. Fashionable pathology often has the appearance of a palimpsest, its late and erroneous neologisms written over elder, unrecognized, and half-indecipherable vital verities.

It is, in truth, most strange that the science of illumination, as related to ocular physiology and pathology, has scarcely been thought of. We are in a state of utter barbarism concerning it. With all the writing upon occupational diseases plainly due to understimulation, overstimulation, and morbific stimulation of the eyes by light, the essential and basic principles and sciences of photology and photometry have not even been asked for. The tragedies of the albinos, of the nystagmics, of the glass blowers, and other cataractous patients, of welders and workers with electricity, of millions of school children in dark school rooms, of the snow-blinded—these show that a new world of truth as to the proper light stimulus for the eyes remains to be discovered and systematized

for humanity's benefit. The use, the nonuse, and the misuse, the world over, of burnooses, hoods, turbans, head wrappings, shades, parasols, fans, hats, and caps, are crude attempts to shade the eyes from hurtful illumination. The whole problem of the tropical diseases of the Caucasian, and of Occidental control of tropical civilizations and barbarisms, is not one of heat, but of illumination, coupled, of course, with eyestrain and the secondary reactions of the organisms against light in the pigmentations of the skin, irises, and retinas. The resensitization of the visual purple of the eyes after exhaustion has been such a million-year-long necessity and difficulty that, to insure it, over a dozen distinct physiological ocular mechanisms have been evolved, and are active every instant of our waking life.

DISCUSSION.

Henry Copley Greene, Massachusetts Commission for the Blind, stated that the commission is working not only to supply work for blind persons, but also to preserve eyesight. It is therefore starting a special class for school children with defective vision and investigating the condition of children with vision of half normal or less, with glasses. Hypermetropic children were found to be more frequent than myopic. What children should presumably be removed from the ordinary schools? Children requiring minus six or minus nine glasses seem obvious cases for a special class. But what of children with lesser defects? What standard can be suggested?

Dr. Charles W. Crankshaw: I desire to offer my appreciation of Dr. Gould's admirable paper, and, as physician in charge of the infirmary of the Prudential Insurance Co. of America, where about 3,500 persons are employed, and of this number about 3,000 as clerks, I have the opportunity of seeing many cases from time to time where the eyes have been at fault in causing many symptoms, from those of a slight nature to those of serious disturbance, the employee being for a time entirely unfitted for duty. Recently a case was brought to the infirmary in a rolling chair, the patient having had a severe attack of vertigo. This patient was a very intelligent young man, and, in addition to his office work, was doing translations at his home in the evenings. The first impression of this case was that of a neurasthenic, but after going over the various phases of the case I decided that the eyes were causing his trouble. He was referred to a conscientious oculist, and I use the term "conscientious," having in mind the fact that results will be far-reaching with such an oculist, just as good results may be expected in surgical cases where the surgeon has the "aseptic conscience." He was advised to remain away from the office for at least one week, and the oculist found a myopic

condition of one eye especially, with astigmatism. After receiving his glasses he returned to his desk, the symptoms disappeared, and he was profuse in his thanks that the cause of his trouble had been found and relieved.

Dr. JULIUS GRINKER, Chicago: Dr. Gould's excellent paper takes cognizance of only one kind of cause, namely, eyestrain. Personally I know, for instance, that typesetters have not much need for glasses, but are neurotic, because, in this country, at least, typesetters are alcoholic. So what proof have we that alcohol is not the real cause of the neuroses? The danger is that we are apt to generalize too much. Dr. Gould is so steeped in eye specialism that nothing but eyes are visible to him, and they are all defective and in need of spectacles. We must take in all the causes, and not merely a single one.

---

[1] This upward looking seems to me trivial as an explanation of nystagmus and of other diseases. Citation of Michael Angelo's poem upon his own case does not carry conviction. Such sufferers exist in thousands who do not work upon objects above their heads.

[2] Examples are: Farmers, typewriters, real-estate dealers, nut and bolt makers, rural mail deliverers or carriers, servants, wagon makers, watchmen, peddlers, teachers, Senators, politicians, and business men.

[3] In one factory the window panes were painted to keep the work folk from looking out.

A NEW THERAPEUTIC AGENT IN OPHTHALMOLOGY.

Dr. C. G. PRECERUTTI, head physician of the ophthalmological section of the Cottolengo Hospital, and head consulting physician at the Ophthalmic Hospital of St. Joachim, of Turin.

In the course of his researches into the physiological action of the different electrical emanations (radiation), the author, having ascertained that they produce a sensible modification of our organism, causing an increase of the circulation and a dilatation of the lymphatic vessels, and thinking that in the living organism these modifications take place as a result of the action of the galvanic current, wished to determine if radium would give the same results when applied to the eye, in the treatment of which electrotherapeutics holds such an important place.

As a matter of fact, radium, being composed of alpha α (anodic) and beta β (cathodic) rays, lends itself wonderfully to this purpose. Thanks to his own experiments, and to those of other scientific men, the author has been able to prove that radium ionises the air.

When we shut up a quantity of radium in a glass, we observe an ionisation of the air between the eye and the glass. These ions, thrown out at a speed only slightly less than that of light rays,

easily penetrate into the human body, and, in the case of the eye, there is even less resistance, for, whereas the skin (epidermis) generally offers a considerably higher degree of resistance to the passage of the current than any other animal tissue, in the eye the resistance is reduced to a minimum, on account of the opening of the eyelids.

With regard to the penetrative power, we have the decisive experiments of Rutherford which demonstrate that radium rays, taken altogether, are thrown out to a distance of 80 millimeters in the air, and that they are transmitted still more easily to a distance of several centimeters. The fact that the rays always travel some centimeters in the air should answer those who urge, as an objection, the weak penetrative power of α radium rays.

One of the peculiar properties of radium is that it penetrates through the substance of the vessel in which it is inclosed, and glass is the substance which offers least resistance to its passage. As a matter of fact, in the treatment of morbid growths, where radium is used as a curative agent, it is inclosed in a glass vessel of appropriate form, which is then applied to the diseased part, either directly, or at a short distance, whence the curative rays emanate.

One important fact, which is particularly worthy of our attention with respect to the invention under discussion, is that the author has been able to prove that, in spite of the radioactivity of the lens—and we need not mention the experiments that have proved that, in these proportions, all irritating effects are impossible—the cornea and the crystalline lens of living animals, after a long exposure to a strong emanation of radium, do not suffer the slightest alteration, and the pupillary reaction also remains intact.

Flemming also communicated to the Ophthalmological Society of Berlin a few months ago that, having exposed the cornea of rabbits for 20 hours to the action of radioactive rays, he has been able to prove that they underwent no change (which is certainly owing to the nonvascular structure of the cornea).

The author bids us note that the emanation thrown out from radium is never modified, even by the action of the most powerful agents. Neither acids, nor the platinoids blown by electricity to the highest possible temperature, nor chromate of lead blown red-hot, have been able to modify it; neither is it modified by being incorporated with glass, although, in this case, the material is subjected to very high temperatures.

A proof of this is the photographic plate, which receives an impression even at a certain distance, and the electroscope of Prof. Curie, with which the ionisation of the air can easily be demonstrated, determining the radioactivity of the lens.

Here the author makes another observation, namely: On first reading the description of the curative effects of radium, one might be

led to believe that it has a modifying and even a destructive action on the tissues. I declare at once that the action is directly in proportion to the radioactivity of the salt or radioactive substance used, as is the case with all substances whose effects vary according to the more or less concentrated dose in which they are employed.

But, in order to explain the true action of the radioactive glass on the eye, we shall endeavor to define it.

By means of the measured radiation emanated by the radioactive glass, the fluids of the eye are rendered electrolythic and we thus produce, on the globe of the eye and on its appendages and inner membranes, a slow and gradual cathaphoretic and ionising action.

It is quite natural that the lens should have a cathaphoretic action, when we consider the various kinds of collyrium that are used for all morbid conditions of the eye, such as mydriatic, myotic, analgesic; disinfectants acting on the exchange, and so forth.

Finally, in answer to the objection that the small quantity of radium contained in the lens is insufficient to serve the purpose proposed by the author, the experiments described at the end of this paper prove that it has been found sufficient for the use to which it is destined. Moreover, I would remark that, independently of the numerous personal trials which I have given it, I could bring another proof of the soundness of my assertion and that is hydrology, through which it has been possible for us to know that the curative properties of certain waters is due to infinitesimal quantities of radium which they contain; for example, the waters of Carlsbad.

If we are to trust the analyses of theories of ions, we know that electrolythic solutions show their activity particularly when the electromotive power is very feeble.

It is natural that one of the first therapeutic results of radioactive lenses should be analgesic (of this I shall speak in another paper), and, considering the knowledge we have had of the analgesic properties of radium ever since its first discovery, the fact might have been taken for granted, and any mention of it is almost superfluous.

The rays emanated by radium are of three kinds, α, β, γ, and these last may be compared to X rays. It would seem, then, that the presence of these rays should cause capillary hyperœmia of the choroid membrane by causing disturbances of the nutrition, but we have learnt from Herman that if the action is moderate we get a stimulation of the exchange of the epidermis (ciliary border), which has been taken advantage of in certain cases of ciliary blephatitis and of neuralgia.

Morris Sachs, who was really the precursor of experimenters in seeking to determine the action of radium on the eye, was the first to prove that the action of radioactive rays affect not only the front of

the retina but also the back, a phenomenon by KONIGSTEIN which was attributed to the fluorescence of the membranes of the eye caused by the induced radioactivity.

To sum up, Dr. Precerutti's radio-active lens, besides answering all optical purposes, being a corrective lens similar to those already on the market, is at the same time a curative lens containing in the glass a radium salt, chosen and measured so that only its therapeutic emanations can be utilized, and these in small quantities and for considerable periods. This is the only way in which practical and constant effects can be obtained by the use of radium.

This lens is absolutely safe, and persons who have used it have never had to complain of any derangement. On the contrary, our experience has given positive results that have but confirmed all our expectations.

The lens I have used in my practice, and in which I had incorporated a radioactive salt, had nothing particular about it, as far as its shape and corrective power were concerned. It was, indeed, worked like the usual lens for the correction of defects of vision. I have used it mounted as spectacles and pince-nez, and I have never had occasion to note that it produced the slightest irritation, although the patient wore it continuously.

AN UNSUSPECTED CAUSE OF CAISSON DISEASE.

T. KENNARD THOMSON, honorary vice president of the American Society of Mechanical Engineers.

In order not to repeat what others have said, I will simply try to emphasize one point, and that is that foul atmosphere, even at very low pressure, is often more dangerous to men than much higher pressure where the air is not so contaminated.

We are considering the effect on the human body of forcing enough air into a working chamber of a horizontal tunnel or vertical shaft to prevent the water entering that chamber while the men are excavating or doing other work.

The air must, of course, be compressed sufficiently to hold back a head of water equal to the depth above the cutting edge of the caisson. So if the cutting edge is 100 feet below the surface of the water, and we assume the water to weigh 62½ pounds per cubic foot, then the weight of a column of water 1 inch square and 100 feet high will be 43.4 pounds; so the air pressure required to balance a 100-foot head of water is 43.4 pounds per square inch, in addition to ordinary atmospheric pressure, and will vary exactly as the depth for greater or less penetration.

Two actual cases will be cited to prove the above statement about foul air:

The first case was on the Ohio River, where a caisson had been sunk to rock and the working chamber filled with concrete, and the steel shafting above the deck was being removed. In this particular case there were several working shafts, 3 feet in diameter, to permit the men and material to enter and leave the caisson. About 8-foot lengths of these shafts were bolted to the roof or deck of the caisson and buried in the concrete, though sometimes only 2-foot lengths were thus buried. Timber forms prevented the concrete coming into contact with the shafts above this level, as it was much cheaper to remove the steel shafts before filling the space with concrete.

Now, when pumping compressed air into a vertical caisson or horizontal tunnel there is a very considerable loss of air into the soil, and this loss requires continual pumping of fresh air into the working chamber, thus keeping the atmosphere fairly good. But as soon as the concrete in the working chamber is brought above the cutting edge the amount of lost air is reduced very considerably, and by the time the air chamber and bottom section of the shaft is filled there is comparatively little escape of air, and very little pumping is required. The air pressure should, of course, be reduced as each foot of concrete is placed in the working chamber and shaft; otherwise the air would tend to blow the water out of the concrete.

Now, in the case cited, a skilled mechanic thoroughly accustomed to working in compressed air was in the shaft after the bottom section had been filled with concrete and the air pressure reduced accordingly, and took, for some reason or other, a little longer than usual to remove the bolts and just had time to signal for help before being overcome, and was taken out dead, although he was apparently in perfect condition when he entered the shaft and working under conditions to which he was well accustomed.

The second case was in the caissons for the Lenox Avenue Bridge in the Harlem River, New York City, in 1901–2, where considerable trouble was caused by men complaining of the "bends" (caisson disease) when passing through the foul mud in the bottom of the river, although the air pressure was not high enough to be noticed under ordinary conditions, and in each caisson, after the cutting edge had penetrated into the clean clay at much greater depth, the trouble ceased.

It might be stated that "sand hogs," as caisson workmen are called, do not pay much attention to air pressures below 15 to 20 pounds in addition to atmospheric pressure, but from 20 to 30 pounds the change is noticed very quickly, while 48 to 50 pounds is the very highest that men can stand under present working condi-

tions, and even then the time of the working shifts is only three-quarters of an hour twice a day.

The writer had the "bends" twice in less than 25 pounds pressure, after the cutting edge had been sealed, and has worked in 42 pounds without any ill effects, showing that the foul atmosphere, his temporary condition, or some other cause did the damage in the lower pressure.

It might be stated that the Harlem River is a short stretch of water about 6½ miles long, connecting the North or Hudson River with the East River and passing through the city of New York, and thus forming the island of Manhattan. Many sewers drain into the Harlem, Hudson, and East Rivers, and it is claimed that the tides (4 to 5 feet) carry all the sewage out of the Harlem River into the Hudson or East Rivers; but as proof that this is not so, in addition to the above-cited case, it might be stated that any excavation made from the surface in the Harlem River discloses a black putrid mud of very offensive smell; and, further, the gas from this mud is continually escaping to the surface—all of which shows the criminal folly of depositing sewage in the Harlem River. Nor should it be allowed to enter any of the rivers or bays of New York, but should be treated or carried out to the ocean in a large trunk sewer; otherwise a great epidemic will sooner or later occur.

DIE GEFAHREN DER CAISSONARBEIT.

Dr. Philipp Silberstern, k. k. Polizei-Ober-Bezirksarzt (Wien).

Das Interesse, welches den Gefahren der Druckluftarbeit zugewendet wird, ist in fortwährender Steigerung begriffen. Es äussert sich in Wort und Tat. Die Autoren haben die persönliche Führung auf dem langsamen Wege übernommen, auf welchem das Menschengeschlecht in die Wassertiefe vorzudringen sucht.

Noch kein Caissonarbeiter war in jenem Ueberdrucke beschäftigt (6.1 Atmosphären), welchen Greenwood[1] im November 1905 erreicht hat; noch kein Berufstaucher ist folgenlos aus einer solchen Tiefe (64 m entsprechend dem Ueberdrucke von 6.4 Atmosphären) zurückgekehrt, wie Damant im August 1906.

Vor zwanzig Jahren wurde an der Möglichkeit gezweifelt, dass ergiebige Arbeit in Luft von einem Drucke geleistet werden kann, welcher in der Tiefe von 50 m dem Wasserdrucke das Gleichgewicht hält (5 Atmosphärenüberdruck). Die Experimente Layet's und der französischen Studienkommission 1894 waren nötig, um diese Zweifel zu zerstreuen.

Weiter werden seither die Grenzen gesteckt, bis zu welchen der Mensch, von der Druckluft des Taucheranzuges oder des Caissons

umschlossen, im Wasser bezw. unter dem Wassergrunde in wasserführendem Boden zu arbeiten imstande ist. In dem Werke der englischen Tieftauchkommission, bezw. Haldane's finden wir die Zuversicht, dass auch in Wassertiefen von mehr als 100 m mit den gegenwärtigen Hilfsmitteln vorgedrungen werden kann.

Das Schreckbild der Sauerstoffvergiftung verblasst einigermassen. Noch kein Tieftaucher, geschweige denn Caissonarbeiter hat im Stadium des konstanten Ueberdruckes die Konvulsionen und die Lungenentzündungssymptome acquiriert, welche das Tierexperiment bei hohem Druck und langer Aufenthaltsdauer erwarten lässt.

Auserordentlich häufig sind dagegen die Krankheitsgefahren, welche dem Caissonarbeiter (und Taucher) nach dem Uebertritte aus der Druckluft in die freie Atmosphäre drohen. Die Eigenart dieser Drucklufterkrankungen ist nunmehr allgemein anerkannt und in das Bewusstsein weiter Kreise gedrungen, ein Fortschritt gegen die Zeit, in welcher diese Erkrankungen von einflussreicher Seite als Aeusserungen des Alkoholismus gedeutet wurden und meinen prophylaktischen Bestrebungen das misdeutete Wort entggenarbeitete: "Es gibt keine Caissonkrankheit."

An allen Orten, an welchen Bauarbeiten unter grösserem Ueberdrucke stattfinden, werden plötzlich einsetzende, stürmisch verlaufende, oft flüchtige Ausschleusungskrankheiten beobachtet. Da sie nicht immer innerhalb der ersten Stunde nach Verlassen der Arbeit, sondern manchmal erst nach vielstündiger Latenzzeit auftreten, mithin oft genug sich auf der Strasse ereignen, allarmieren sie die grosse Oeffentlichkeit. Infolge des Vorkommens von Invaliditäts- und Todesfällen, welche durch geeignete, beim Baubeginn zu treffende Vorkehrungen verhütbar sind, belasten sie die Unternehmungen und die Behörden mit der grössten Verantwortlichkeit.

Unbestritten ist P. Bert's Lehre, dass in der komprimierten Luft des Caissons die Körpersäfte umso reichlicher die Gase des umgebenden Mediums, vorwiegend Stickstoff aufnehmen, je höher der Druck ist. Nach fehlerhaftem Druckabfall kommt es zur Entladung von Luftbläschen in den Gewebsflüssigkeiten und im Blute. Den anschaulichsten Nachweis haben 1903 Hill und Macleod beschrieben, welche am unverletzten Tiere das Entstehen von Luftbläschen nach dem Druckabfall verfolgen konnten, als sie unter Verwendüng einer mit Schau gläsern ausgestattëten Druckluftkammer den Kreislauf in den Blutgefässen der Froschschwimmhaut beobachteten.

Die Lehre P. Bert's wurde durch eine unscheinbare, zahlreiche Widersprüche zwischen Theorie und Erfahrung überbrückende Feststellung Vernon's 1907 ergänzt: "Von Fetten und Lipoiden wird nahezu sechsmal so viel Stickstoff absorbiert als vom Blute." Durch Vernon's Feststellung ist die vorzugweise Gefährdung bestimmter

Organe zu erklären, wie sie experimentell als lokale Gasentwicklung in den Gewebsspalten des Fettgewebes, in der Substanz der schwächer durchbluteten und schwerer zu entgasenden Rückenmarksabschnitte ihren Ausdruck findet.

Die übliche, von mir herrührende Bezeichnung Aërämie umfasst nicht sämtliche Krankheitzustände. Sie muss, wie insbesondere der Befund von Luftbläschen in der Gelenksflüssigkeit zeigt (Haldane, Quincke), durch die Bezeichnung Aërolymphe ergänzt werden. Durch ihre Häufigkeit belasten die Glieder- und Gelenksschmerzen trotz kurzer, zumeist eine Woche nicht überschreitender Dauer die Krankenkasse-Statistik in hohem Grade. Weit wichtiger sind die Ménièreschen Erscheinungen und die Rückenmarkslähmungen (Ischämie, Erweichungsherde), welche bleibende oder vorübergehende Invalidität bedingen. Luftembolien im Gebiete des kleinen Kreislaufes kommen in erster Linie als Ursache der foudroyanten Todesfällen in Betracht.

Vernon's Feststellung hat es ermöglicht, das Gefahrsmoment der Aufenthaltsdauer in komprimierter Luft einheitlich zu werten. Schon beim Bau der Mississippi-Brücke zu St. Louis 1870 hat Eads festgestellt, dass gelegentliche Besucher der Drucklufträume gesund blieben. Als mit dem Sinken der Caisson und mit dem Steigen des angewandten Ueberdruckes die Entschleusungskrankheiten immer zahlreicher und gefährlicher wurden, gelang es Eads durch Reduktion der Schichtdauer auf eine Stunde, die schweren Krankheiten zu verhüten. Von den Technikern wurde in verschiedenem Masse der Notwendigkeit Rechnung getragen, die Schichtdauer mit steigendem Ueberdrucke zu verkürzen.

Nun hat Zuntz 1897 die zahlenmässige Erfassung der Vorgänge bei der Gasaufnahme gelehrt. Rasch erfolgt die Stickstoffsättigung des die Lungenkapillaren durchströmenden Blutes. Ein rasches, wenngleich allmählig sich verzögerndes Tempo wurde für die Sättigung der Gewebsflüssigkeiten angenommen, so dass es gleich gefährlich schien, ob jemand eine oder mehrere Stunden im Caisson sich aufhalte.

Zuntz hat die Rechnung ohne Fette und Lipoide gemacht. So manche Autoren, welche gleich mir in Druckluft Beobachtungen anstellten, haben das erhebende, aber durch nichts gerechtfertigte Gefühl genossen, eine grosse Gefahr überstanden zu haben. Die Stickstoffspeicherung der Gewebe, insbesondere der fetthaltigen, ist ein langsamer Vorgang. Sie erfordert nach Boycott-Damant-Haldane etwa 5, nach Bornstein etwa 9 Stunden. Sicher ist nicht in 20 Minuten, wie von Schrötter berechnet, sondern erst in einem Vielfachen dieser Zeit die Gefahrsgrenze erreicht.

Die Verkürzung der Schichtdauer, wie sie im holländischen Gesetze angeordnet ist, geht nicht zu weit, wie Zuntz auf dem letzten hy-

gienischen Kongress andeutete. Sie geht nicht weit genug und wird mit Recht vom New Yorker Gesetz in ähnlichem Ausmasse präzisiert, wie es Brennecke im Handbuch der Baukunde 1887 getan.

Arbeiten, bei welchen eine Atmosphäre Überdruck nicht erreicht wird, bedingen nicht die Gefahren der Aërämie und Aërolymphe und bedürfen keiner Schichtverkürzung. Sie können nur Trommelfell- und Mittelohraffektionen, relativ harmlose Erkrankungen verursachen, wenn der Arbeiter in der Vorkammer einem allzuraschen Druckanstiege ausgesetzt ist und wenn bei minder wegsamer Ohrtrompete sich der Druckausgleich zu beiden Seiten des Trommelfells verzögert.

Von entscheidender Wichtigkeit für die typischen Gefahren der Druckluftarbeit ist die Schnelligkeit und Art des Druckabfalles. Beim Caissonbetrieb erscheint es notwendig, für die Dekompression um eine Atmosphäre Überdruck durchschnittlich die Zeit von 15–20 Minuten zu widmen.

Die schlechten, durch kurze Ausschleusungszeit bedingten Resultate wurden vielfach auf die Ungleichmässigkeit der Druckverminderung bezogen. Beim Oeffnen des Ausschleusungshahnes strömt der Ueberdruck zunächst sehr rasch, dann immer langsamer und langsamer ab, weil die Druckdifferenz zwischen Schleusenluft und Druckluft während der Ausschleusung immer geringer wird. Zur Abstellung dieses scheinbaren Uebelstandes gaben Michel 1879 u. A. sinnreich konstruierte Ausschleusungshähne an, verlangten mit besonderem Nachdrucke Heller-Mager-von Schrötter gleiche Dekompressionszeiten für jedes Zehntel einer Atmosphäre und bestimmte das niederländische, sowie das französische Regulativ längere Ausschleusungszeiten für die ersten, wie für die späteren Stadien der Ausschleusung.

Im Gegensatz zu diesen Bestrebungen brachte das Jahr 1907 eine wichtige, den scheinbaren Uebelstand systemisierende Errungenschaft: Haldane's staffelförmige Dekompression, welche auf Vernon's Feststellungen Bezug hat und auf folgenden Erwägungen basiert: Selbst während der langsamsten Ausschleusung entledigt sich der Organismus nicht völlig seines überschüssigen Stickstoffes. Insbesondere dauert es eine Reihe von Stunden, ehe die in den fetthaltigen Geweben aufgespeicherte Gasmenge vom Blute aufgenommen wird, um in die Kapillaren der Lunge, des Darmes, der Haut befördert zu werden und in die Aussenluft zu diffundieren. Blut und Gewebsflüssigkeit sind fähig, ein bestimmtes Gasvolumen in übersättigter Lösung festzuhalten. Luftbläschenbildung und Krankheitsgefahr droht erst dann, wenn der Stickstoffdruck in den Körpersäften mehr als zweimal jenen der atmosphärischen Luft überschreitet. Jede Druckhöhe kann ohne Gefährdung der Druckluftarbeiter brüsk bis auf die Hälfte des Totaldruckes reduziert werden. Beim Sinken des Totaldruckes von 6 auf 3 Atmosphären wird dasselbe Gasvolumen

überschüssig, wie beim Sinken des Totaldruckes von 2 auf 1 Atmosphäre, i. e., beim Ablassen des Ueberdruckes von 1 Atmosphäre. Der plötzliche, ruckweise Druckabfall ist sicherer wie der gleichförmige. Die staffelförmige Dekompression mit entsprechend langen, je nach der Aufenthaltsdauer in komprimierter Luft bemessenen, tabellarisch zusammengestellten Pausen und besonders langsamem Ausgleich der letzten halben Atmosphäre des Überdrucks hat sich an den Tauchern der englischen und der italienischen Kriegsmarine bewährt.

Haldane's Methode der "stage decompression" bedarf für die Caisson arbeit einer entsprechenden Modifikation, welche ihre Vorteile verwertet, ihre Nachteile ausschaltet. Ein Nachteil ist der einleitende allzu grosse und allzu starke Drucksturz mit seinen Abkühlungs- und Durchnässungseffekten.

Für den Caissonbetrieb ist nach meinem Vorschlage die erste Hälfte des Druckabfalles derart zu beschleunigen, dass etwa ¾ Minuten auf je 0.1 Atmosphären, die zweite Hälfte derart zu verlangsamen, dass etwa 3 Minuten auf je 0.1 Atmosphären entfallen.

Nicht im Caissonbetreibe, wohl aber bei pneumatischer Vortreibung von Tunnels können Unterbrechungen des Druckabfalles mit besonderem Vorteile verwendet werden. Das Verweilen des Arbeiters in einer intermediären Tunnelstrecke, "Purgatorium" Haldane's, welche als Aufenthaltsraum ausgestattet ist, sich mit Sauerstoffapparaten versehen lässt und einen geringeren Ueberdruck als den einer Atmosphäre aufweist, ermöglicht es, den Aufenthalt in der nachfolgenden, räumlich beengten Luftschleuse abzukürzen. Ein längerer Weg, welcher unter gleichem Ueberdruck von einer Luftschleuse zur nächsten zurückzulegen ist, sichert die nötigen Ausschleusungspausen und veranlasst leichte körperliche Betätigung, mithin eine Beschleunigung des Blutumlaufes und der Entgasung.

Auch im Punkte "Auswahl der Arbeiter" vollzieht sich die Rückkehr zur Weisheit der Alten. Niemand bezweifelt, dass Herz- und Lungenkranke von der Caissonarbeit ferngehalten werden müssen und dass verschiedenartige pathologische Zustände die Entgasung beeinträchtigen können. Aber selbst unter gesunden und jüngeren Arbeitern sind nicht alle in gleichem Grade für die Druckluftarbeit tauglich. Die von früheren Beobachtern angenommene, von Heller-Mager-von Schrötter negierte Disposition für die Caissonkrankheit besteht zu Recht.

Physische Eignung für die Druckluftarbeit dürfen wir dem berühmten Taucher Erostarbe zuerkennen, welcher, um Silber aus einem gesunkenen Schiff zu heben, durch Wochen aus Wassertiefen von mehr als 50 m 2–3-mal täglich mit gefahrdrohender Schnelligkeit aufstieg. Auf besondere Empfänglichkeit für die Caissonkrankheit müssen wir dagegen die permanente Rückenmarkslähmung jenes Druckluftarbeiters zurückführen, von welchem Keays 1910

berichtet, dass er nach der Schleusungsprobe (einstündiger Aufenthalt unter dem Ueberdrucke von 2.2 Atmosphären) und nach ¼-stündiger Dekompressionszeit erkrankte. Dass grösserer Fettgehalt des Körpers oder der Nahrung zur Erkrankung disponiert, ist durch Vernon's Feststellung begreiflich und durch den Caissontod veranschaulicht, welchen die fetten Meerschweinchen Boycott-Damant's im Gegensatze zu den magern fanden. Mit grösserem Verständnis erinnern wir uns daran, dass A. Smith die Körperfülle von Caissonarbeitern perhorreszierte und dass beispielsweise bei den pneumatischen Fundierungen zu Toulon in den 70er Jahren, fettleibige Arbeitswerber nicht aufgenommen wurden.

In der minderen Gefährdung des geschulten Caissonarbeiters im Vergleiche zu jener des Neulings prägt sich meines Erachtens nur die individuell verschiedene Eignung aus. Die natürliche Auslese ist es, welche unter enormem Arbeiterwechsel das Ausscheiden der untauglichen und das Zurückbleiben der tauglichen Leute bewirkt. Wenige Schleusungsproben, wie sie von Keays angewendet wurden, genügen, um besonders disponierte Personen zu erkennen und Leute, welche schon bei geringem Ueberdruck oder bei geringer Aufenthaltsdauer in Druckluft erkranken, vor Arbeit bei höherem Ueberdruck und vor schwerer Schädigung zu bewahren.

Eine Steigerung der Gefahren für den Caissonarbeiter durch reichlichen, beispielsweise 2 Prozent betragenden Kohlensäuregehalt der Druckluft ist nach den Untersuchungen Greenwood und Hill's nicht anzuerkennen. Ja, vom Kohlensäurereichtum der Schleusenluft versprechen sich die genannten Forscher sogar günstigste Erfolge, eine Steigerung der Lungenventilation und eine raschere Stickstoffausscheidung während der Dekompression. So bemerkenswert diese Untersuchungen sind, so wenig dürfen sie die Hygiene der Caissonarbeit beeinträchtigen. Welche Bedeutung mangelhafte Luftzufuhr und Kohlensäureintoxikation im Stadium des Ueberdruckes für die Arbeiter gewinnen kann, hat Haldane selbst gezeigt. Im Berichte der englischen Tieftauchkommission, dem bedeutendsten einschlägigen Werke seit P. Berts Tagen, weist er nach, dass die Kohlensäurespannung im Helme es ist [und nicht der Luftdruck], welche die Kraftlosigkeit und Benommenheit von Tauchern bei hohem Ueberdruck erklärt. Durch Festsetzung der für die jeweilige Tiefe erforderlichen Luftmenge hat Haldane die Leistungsfähigkeit des Tieftauchers gesichert. Auch in der Arbeitskammer des Caissons hat bei einzelnen Fundierungen die Kohlensäurespannung eine an sich bedenkliche Höhe erreicht.

Für gewöhnlich hat die Kohlensäure des Caissons keine Bedeutung als toxische Substanz. So manchesmal aber ist sie als Indikator ungünstiger Temperatur-, Feuchtigkeits-, Luftzuführungsverhältnisse beachtenswert. Thermische, chemische und andere Schädlich-

keiten, welche die für die Entgasung wichtige Funktion der Haut, des Darmes, der Lungen beeinträchtigen oder die Herztätigkeit verringern, können zur Caissonkrankheit prädisponieren.

Wie bisher müssen wir grosse Luftschleusen anstreben. Wir müssen auch weiterhin das Zusammenpferchen der Arbeiter hintanhalten und müssen den Temperatursturz der Ausschleusung verhüten, wie es in Amsterdam mittels elektrischer Oefen durchgeführt wurde. Einen Menschenüberfüllten und hiedurch Kohlensäurereichen Raum möchte ich niemals als Inhalatorium anpreisen, stets nur als Ausdruck eines hygienischen Uebelstandes verwerfen.

Seit den Zeiten François' ist mässige Bewegung nach der Ausschleusung üblich. Der Hinweis Bornstein's, dass intensive Arbeit während und nach der Ausschleusung die Stickstoffausscheidung maximal beschleunigen würde, die Bedenken Quincke's, dass jede Bewegung die Gasbläschenbildung in übersättigter Lösung anregen kann, sind Laboratoriumsergebnisse eines und desselben Jahres 1910. Der Praktiker wird sich nicht vom Mittelwege ablenken lassen; er wird nicht der Ueberbürdung das Wort reden, welche die Herzaktion und Entgasung ungünstig beeinflusst und wird nicht auf Seite Lauenstein's zu finden sein, wenn dieser die Mannschaft nach getaner Arbeit ins Bett zu bringen versucht. Die Rückversetzung erkrankter Caissonarbeiter in Druckluft gilt seit den Arbeiten im Gebiete von Douchy 1847 als das Rettungsmittel in der Gefahr. Der Mechanismus der Wirkung wurde 1903 von Hill und Macleod veranschaulicht, welche während der Rekompression das Verschwinden von Luftbläschen im unverletzten Tiere nachweisen konnten, als sie unter Verwendung einer mit Schaugläsern aus. gestetteten Druckkammer die Blutgefässe der Froschschwimmhaut beobachteten.

Eine Gruppe von Autoren (u. a. Houdeville, Lauenstein) hat Zweifel an der Wirksamkeit des Mittels ausgesprochen. Jedes Heilmittel kann in einzelnen Fällen versagen, insbesondere bei verspäteter, nach Ausbildung irreparabler Gewebsschädigungen einsetzender oder unsachgemässer Anwendung. Wohl alle Augenzeugen der Rekompression sind gleich mir Augenzeugen der Rekompressionserfolge. Nach wie vor kann auf die Unterbringung der Arbeiter nächst dem Arbeitsplatze, auf ärztlichen Permanenzdienst und auf die Bereitstellung einer mit Sauerstoffapparaten versehenen Rekompressionskammer bei einem Ueberdrucke, welcher 1.5 Atmosphären erricht, nicht verzichtet werden.

Zuntz hat vorgeschlagen, während der Ausschleusung durch Sauerstoffatmung die Spannungsdifferenz zwischen Stickstoff des Körpers und jenem der Schleusenluft zu vergrössern, um die Stickstoffausscheidung zu beschleunigen. Für die Kranken in der Rekompressionskammer ist dieser Vorschlag wichtig, dessen Wirksamkeit und Anwendbarkeit in der Luftschleuse Bornstein erprobt hat: Die

Atmung eines 90–95 Prozent Sauerstoff enthaltenden Gasgemisches hatte selbst bei ½-stündiger Dauer und bei einem Ueberdruck von zwei Atmosphären noch keine nachteiligen Folgen gezeitigt, ist mithin in der zweiten Phase der Dekompression selbst nach Erreichung höheren Ueberdruckes anwendbar.

Das Mass der Gefahr wird immer noch unterschätzt. Die in der Literatur niedergelegten Zahlenverhältnisse bedürfen einer Interpretation. Der Bericht der englischen Tieftauchkommission entreisst die unvorsichtige Ausschleusung beim Scorff-Brükenbau 1862 der Vergessenheit, bemerkt aber, dass nur zwei Todes- und 14 ernste Erkrankungsfälle vorkamen, trotzdem die Zahl der Schichten 8,042 betrug. Nun bedeuten 8,042 Schichten nichts grosses, sie sind der Jahresleistung eines Arbeiterstandes von nur 10–15 Mann gleichzusetzen, von denen jeder zweimal täglich eine vierstündige Arbeitsschichte absolviert. Ein einziger Pfeiler der Brücke erreichte die Versenkungstiefe von 18 m. Nur wenige Tage hindurch war ein Ueberdruck nötig, welcher schwere Erkrankungen oder Todesfälle ermöglicht. Unter den 14 Fällen figuriert nicht jener des Ingenieurs Gallois, welcher eine Rückenmarkslähmung erlitt, vergebens eine Entschädigungsklage gegen die Unternehmung einbrachte und zwei Jahre nach dem Unfalle starb. Die verantwortlichen Organe der Unternehmung wurden vom Tribunal von Lorient und vom Appellgerichtshof von Rennes freigesprochen. Die Nachwelt kann die Bauführung von Verschulden nicht freisprechen und wird ihre Sympathien dem Andenken des Ingenieurs Gallois bewahren.

Das imposanteste Werk der Tiefbautechnik unserer Zeit, die pneumatische Vortreibung der East River tunnels 1906–1908 unter einem Ueberdrucke von 2.1, gelegentlich selbst 2.8 Atmosphären, hatte, wie Keays berichtet, über 3,600 Drucklufterkrankungen, darunter 20 Todesfälle im Gefolge. Da infolge des grossen Arbeiterwechsels die durchschnittliche Verwendungsdauer jedes Arbeiters nur wenige Wochen betrug, ist für die Morbiditäts-Statistik das Résumé nicht verwertbar, welches die Mortalität mit Rücksicht auf die Zahl der untersuchten 10,000 Arbeiter auf bloss 0.2 Prozent angibt. Wohl aber lässt sich gewerbehygienisch verwerten, dass die Morbidität bezogen auf 557,000 Arbeitsschichten 0.66 Prozent, die Mortalität 0.0035 Prozent betrug. Es waren durchschnittlich nicht mehr als 1,000 Mann täglich beschäftigt; es kamen im Jahre mehr als 2,400 Drucklufterkrankungen und mehr als 12 Drucklufttodesfälle vor. Die englische Tieftauchkommission hat die Druckluftaffektionen der ersten vier Monate mitgeteilt: 4 Todesfälle, 62 schwerere, 515 leichte Erkrankungen, bei rund 60,000 Dekompressionen. Es gereicht dem ärztlichen und technischen Stabe zur grössten Ehre, die ursprünglichen Massnahmen immer von neuem verbessert und ein weit gün-

stigeres Gesamtresultat erzielt zu haben, als die ersten vier Arbeitsmonate voraussehen liessen.

Wenn nun unter so hervorragender Leitung eine immer noch grosse Gefährdung der Caissonarbeiter resultiert, dann lässt sich ermessen, wie sehr für gewöhnlich Gesundheit und Leben der Druckluftarbeiter bedroht sind. Nur zu gut sind die krassen Misstände anderer Druckluftgründugen bekannt: Schleusen ohne Manometer, Caissonarbeiter ohne Tauglichkeitsbefund, Schleusenmänner ohne Uhr, Caissons ohne Schutz vor exzessiver Temperatur, schwerster Luftverderbnis, unsinnigen Drucküberschreitungen, überflüssigen Druckschwankungen, Bauplätze ohne Anschlag einer Arbeitsordnung oder eines Merkblatts, Aufsichtsorgane ohne Kenntnis der geltenden Vorschriften.

Brennecke spricht sich nicht mehr gegen die behördliche Kontrolle der Druckluftarbeit aus. Er schliesst sich vielmehr den Argumenten an, welche ich als Referent unseres Themas auf dem Berliner hygienischen Kongress vorgebracht habe. An dem Verhältnis der Krankheitsfälle zur durchschnittlichen Arbeiterzahl, einer für Caissonarbeiten nicht üblichen Berechnungsart, konnte ich die beispiellose Morbidität, Invalidität und Mortalität, die erschreckenden Gefahren der Caissonarbeit nachweisen.

Die Befolgung der nötigen Vorsichtsmassregeln ist mit Kosten verbunden, welche den Betriebsfond belasten. Die Vernachlässigung der nötigen Vorsichtsmassregeln ist mit noch grösseren Kosten verbunden, welche die Wohlfahrtsfonds belasten, insbesondere die staatlichen oder berufsgenossenschaftlichen Unfallsversicherungen. Bei den Wien-Nussdorfer pneumatischen Fundierungen hätten, wie ich a. a. O. berichten konnte, die Unfallsversicherungs-Prämien nicht weniger als 55 Prozent des Einkommens eines jeden Arbeiters betragen müssen, um die Versicherungs-Anstalt schadlos zu halten. Es gibt diese Tatsache ein Bild der Gefahrengrösse, wenn wir uns vergegenwärtigen, dass die Prämien der Unfallversicherung im gewöhnlichen Leben einen nur sehr geringen Prozentsatz des Einkommens ausmachen und dass der höchste Unfallsversicherungsbetrag, den die Versicherungsanstalt von Betrieben der höchsten Gefahrenklasse einheben könnte, kaum 8 Prozent der Lohnsumme erreicht.

Die Niederlande haben sich unvergänglichen Ruhm in der Geschichte des Arbeiterschutzes gesichert. Allen Staaten voran haben sie Massnahmen vorgeschrieben, um die Gefahren der Caissonarbeit zu mindern. Das Gesetz vom 22. V. 1905 hat seine segensreiche Wirksamkeit bereits erwiesen. Ein grösseres Bauwerk, die Fundierung des westlichen Eisenbahnviadukts zu Amsterdam hat durch nahezu zwei Jahre täglich 50–100 Arbeiter in einem Ueberdrucke bis zu 2.1 Atmosphären beschäftigt. Kein Todesfall, kein Fall blei-

bender Invalidität hat sich ereignet. Harmlose Erkrankungen, allerdings an Zahl 228 betragend, wurden durch die in Kraft stehenden Vorschriften nicht verhütet (Wintgens, Kropveld, Verschuyl, van Thienen).

Dem Beispiele der Niederlande folgend, hat Frankreich 1908, das Staatsgebiet von Hamburg und jenes von New York 1909 Vorschriften erlassen.

Die Vereinigung für gesetzlichen Arbeiterschutz strebt die behördliche Regelung des Caissonsbetriebes in allen Ländern an.

Der beiliegende Entwurf, den ich heuer im Auftrage der österreichischen Arbeiterschutz-Gesellschaft verfasst habe, sucht von den Erfahrungen die ältesten und bewährtesten, von den Forschungsergebnissen die jüngsten und beweiskräftigsten zu verwerten. Der Gang unserer Erkenntnisse erklärt es, dass der Entwurf sich mehr an die guten, alten, nie durchgeführten Regulative Wagner's 1878 und Brennecke's 1884 anschliesst als an die modernen Vorschriften Heller-Mager-von Schrötter's.

Die Druckluftarbeit wird immer mehr als das Prototyp einer gefährlichen Beschäftigung anerkannt. Einem Verfahren gegenüber, welches mit unheimlicher Präzision vom Leben zum Tode, von bester Gesundheit zu immerwährendem Siechtum führen kann, wird das Aufsichtsrecht des Staates zur Aufsichtspflicht. Die gesetzliche Regelung und Verbesserung des Arbeiterschutzes im Caissonbetriebe ist eine notwendige und dankbare Aufgabe jedes Kulturstaates.

[1] Neuere Literaturangaben bringt die in Druck befindliche 2. Auflage meiner "Hygiene der Arbeit in komprimierter Luft." Weyls Handbuch der Hygiene, 2. Auflage.

THE ACUTE EFFECTS OF CAISSON DISEASE.

Seward Erdman, M. D., Cornell University Medical College, New York City.

Of all the occupational diseases which follow in the train of advancing civilization, together with development of arts, sciences, and industries, none is of greater interest, none more dramatic in its manifestations, than the ofttimes tragic effects of the illness to which men are liable who work in compressed air in diving or in subaqueous construction of tunnels, jetties, foundations for bridges, and so forth.

A man in all the vigor of health and strength descends to his daily task in the river tunnel, enters the compressed air, works his regular shift of three or four hours, comes out through the air lock by the ordinary method of decompression, ascends to the street, and starts for his home, feeling perfectly well.

Fifteen minutes later, without the slightest warning, he is attacked with the most intense boring pains in his legs and abdomen, or,

again, he staggers and falls helpless to the ground, paralyzed from his waist down. Fortunate he is if efficient treatment be near at hand, and by recompression in the medical air lock his pains vanish, his paralysis disappears, and on the morrow he returns to his work as usual.

The evolution of theories and devices to enable man to subsist for a time under water begins with the age of Aristotle and Alexander the Great, and constitutes a fascinating study; but the first authentic mention of "caisson disease" is due to Trieger, the French engineer, who first successfully operated a practical caisson in 1839.

The material for this paper is mainly drawn from the writer's own experience of two and one-half years as a member of the medical staff in attendance during the construction of the East River tunnels from New York to Long Island City, the largest single enterprise ever attempted under compressed air, in which more than 10,000 men were employed and 3,692 cases of illness were reported by the medical director, Dr. F. L. Keays.[1]

To designate the train of symptoms resulting from work in compressed air various terms have been used, e. g., "caisson disease," "divers' palsy" "compressed-air illness or sickness," "bends," and so forth.

In an earlier paper[2] I have ventured to employ the term "aeropathy," as being more inclusive and, for philological reasons, more widely available in all languages, and this term I shall employ hereafter in this paper.

ETIOLOGY.

At the outset we will state our acceptance of the theory that gas emboli in the blood and body tissues are the direct cause of aeropathy symptoms, and a clear understanding of the etiology is essential to the correct interpretation of the "Protean" manifestations of this disease.

The animal experiments of Boyle in 1670 laid the foundation for this theory, and its elaboration by Hoppe-Seyler, Bert,[3] Von Schrötter, Silberstern, Leonard Hill,[2] and others has placed the gas-emboli theory in an impregnable position.

Practically all autopsies, if performed early, upon victims of an acute attack of this disease, show gas emboli in the veins and right heart.

All other theories may be dismissed at once, upon the ground that none of them accounts for the formation of a single bubble of gas in the body fluids, which happening we believe to be the one necessary factor in the etiology.

The fluids and tissues of a man working in compressed air become saturated with the gases of the atmosphere to a degree which de-

pends upon (1) the amount of pressure (Dalton's law); (2) the length of exposure; (3) the vascularity and the absorptive ability of the individual tissue.

No symptoms ever develop while a man remains in the compressed air, no matter what the degree of pressure, nor length of exposure; hence we can state dogmatically that the disease is due solely to the ebullition of bubbles of gas (chiefly nitrogen), brought about by "decompression" which is so rapid that the gases can not be carried by the blood to the lungs and there gotten rid of gradually, as they have entered; consequently, they are set free as bubbles in the body tissues and fluids, with disastrous effects in many cases, forming emboli in the circulation or damaging tissues by the force of their expansion.

PHENOMENA OF COMPRESSION.

Certain interesting phenomena are noted during the act of compression, which are largely mechanical, and may be regarded as physiological; certainly they are in no sense symptoms of aeropathy.

(1) The rising pressure forces inward the ear-drum membrane, causing discomfort, acute pain, or even rupturing this structure unless the pressure be equalized by admitting air through the Eustachian tube, by Valsalva's method or an equivalent.

(2) Slight rise in body temperature and sweating occur, due to the heat generated by the compression of the air.

(3) The denser air offers a slight resistance to expiration and phonation. Whispering becomes impossible; and the lessened amplitude of vibration renders whistling difficult or impossible and, in such an attempt, the nonvibrating lips give a sensation of slight numbness.

(4) The voice loses its natural quality and sounds intensely nasal.

(5) A sense of exhilaration and an ease of movement is experienced, and it is claimed that compressed-air work increases the appetite.

Other phenomena of compression have been reported but are now generally discredited, thus:

Pallor of the skin and mucous membranes does not occur, unless it be from nervousness on the part of the man entering compressed air for the first time.

There is no lessening of the volume of the pulse, no constant alteration in the blood pressure, no constant change in the rate either of the pulse or respirations.[4,5,6]

The superficial veins do not collapse; the capillary circulation in a frog's foot continued unchanged. (Hill[2] and others.)

There is no demonstrable change in the urinary or sweat excretion.

Hearing is not affected.

PHENOMENA OF DECOMPRESSION.

Phenomena of decompression include chilling of the body, due to the falling temperature in the air lock, and one may at times note a crackling sound in the ears as the air escapes through the eustachian tubes.

SYMPTOMS OF AEROPATHY.

The symptoms of aeropathy proper occur only as a result of decompression and after its completion.

The time of onset is from within 15 minutes up to a few hours after decompression. Among the 3,692 cases at the East River tunnels about 50 per cent occurred within 30 minutes and 95 per cent within 3 hours; however, 1 per cent were delayed over 6 hours, and of these latter 4 isolated and somewhat doubtful cases were said to have occurred between 15 and 23 hours after decompression.[5]

The commonest types of symptoms are as follows:

(1) Pain is by far the commonest symptom, occurring in over 88 per cent of all cases, either as the only symptom or associated with others.

Its most frequent site is in the lower extremities (70 per cent), in the region of the knees, forcing the victim into an attitude which gives rise to the popular term, "bends" or "courbatures."

Next in frequency are pains in the upper extremities, about the elbows and shoulders, in 30 per cent.

Pains in the abdomen occurred in about 5 per cent of the cases, but were of greater significance than were pains in the extremities, in that they more often preceded or accompanied cases of severe prostration or paralysis.

(2) Vertigo, or, in the parlance of the workers, "staggers," was met with in over 5 per cent, and is explainable by the formation of bubbles in the labyrinth of the internal ear, or, when accompanied by nausea and vomiting, it may be due to cerebellar embolism.

(3) Cerebro-spinal cases, including transient or permanent paralyses, such as hemiplegia, paraplegia, loss of bladder and rectal control, represented 2.16 per cent.

(4) Dyspnœa, called "chokes," of a type resembling an asthmatic attack, occurred in over 1½ per cent, and may well be due to multiple small gas emboli in the pulmonary vessels; for were it of central nervous origin it would naturally be accompanied by other serious nerve disturbances, which is not the case.

(5) Prostration of moderate degree and associated with pains in some part of the body made up 1¼ per cent; and

(6) Collapse, with partial or complete unconsciousness, happened in about one-half per cent (0.46 per cent).

(7) Fatal cases were 20 in number, or 0.54 per cent, and occurred either with rapid onset of unconsciousness and collapse or with pains and prostration accompanied by nausea and vomiting or with paralyses, or from later complications of persistent paraplegia.

CLASSIFICATION OF SYMPTOMS (ACUTE).

The symptoms of aeropathy will vary with the anatomical part affected, with the amount of gas set free, and the consequent degree of disturbance of function.

Connective tissue, especially fat, with its peculiar ability of absorbing four times more nitrogen than other tissues and its poor blood supply, becomes desaturated more slowly than other body tissues, and it is found in practice that fat men are ill adapted to work in compressed air.

Proceeding therefore to tabulate symptoms with reference to the structures affected, we find:

Symptoms referable to the—

(1) *Nervous system.*—(*a*) Peripheral nerves: Pain occurring in the extremities or abdomen in over 88 per cent of all cases, without other evidence of spinal cord irritation except in a little over 2 per cent, must admittedly be due to peripheral irritation of nerves and nerve terminals by bubbles of gas in the nerve sheath, in fascial tissues, beneath the periosteum or in bone marrow.

Numbness, anaesthesia, and paraesthesia are doubtless capable of the same explanation.

One form of paraesthesia, called by the men "itch" or "prickles," is quite common, is distressing while it lasts, but is never of serious import. This may be explained, as Hill [2] does, as due to bubbles in the subcutaneous areolar tissue, but in my experience it is no more common in fat men than in thin men; it occurs especially when sweating has been less free, and it is usually at once relieved by a hot bath or sweating, all of which makes it more probable that it is caused by expanding bubbles in the sweat glands.

(*b*) Central nervous system.—Brain: Unconsciousness, stupor, and collapse may be due to cerebral gas embolism or resulting oedema, or are secondary to circulatory failure due to coronary or pulmonary embolism.

Cerebral gas embolism may also cause aphasia, incoherence of speech, ataxia, vomiting, vertigo, headaches, or such signs as hemiplegia, monoplegia, convulsions, nystagmus, and tongue deviations, depending upon what area is affected.

Actual tearing of nerve tissue and hemorrhage may occur by the expansion of bubbles of gas, resulting in organic lesions.

Spinal cord affections include paraplegia, monoplegia, loss of bladder and rectal control, partial paralyses, spasticity exaggerated,

diminished or absent reflexes; anaesthesia, anaesthesia dolorosa; and, with hemorrhage into the cord, the symptoms may become permanent, and a true myelitis may develop.

Very frequently, however, there is only a temporary weakness and numbness of the legs, with or without retention of urine.

(2) *Special senses.*—(*a*) Eye, transient blindness, diplopia, and nystagmus may occur.

(*b*) Ear, performation of the drum membrane may occur, but only during compression, hence is not properly a symptom of aeropathy. Deafness and vertigo may follow the formation of bubbles in the labyrinth or hemorrhage in the same situation.

(3) *Vascular system.*—Gas emboli in the veins of the systemic and portal system, in the right heart, in the pulmonary and coronary vessels, have been found so regularly in animal experimentation and at autopsies upon fatal cases among men (provided the autopsy be performed within 20 hours after death from an acute attack) that this fact forms the whole basis of our understanding of the etiology of this disease.

The bluish "mottling" of the skin, seen over the chest and abdomen in some of the severer cases, is caused by embolism of the superficial veins, with consequent stasis.

Lymphatic obstruction by gas embolism is, doubtless, the explanation of the several instances of localized edema of a small area of an extremity.

(4) *Respiratory system.*—The symptom called "chokes" has been described above. In certain fatal cases there has been found edema of the lungs; also interstitial emphysema of the parenchyma.

(5) *Gastro-intestinal symptoms*, further than the epigastric pains and the nausea and vomiting above mentioned, are not encountered.

(6) *Internal organs*, such as the liver, spleen, and kidneys, do not give any acute signs, although at autopsy they may be found affected.

(7) *Sexual apparatus* is only affected as a result of spinal-cord injury, which may give rise to priapism, and so forth.

(8) *The bones, joints, and periosteum.*—In one case necrosis of the femur resulted apparently from thrombosis of the medullary artery. The deep-seated pains so frequently referred to the long bones of the extremities and to the joints may be due either to collections of expanding bubbles under the fascial planes or under the periosteum; or, as Hill [2] suggests, in the yellow marrow, which structure is rich in fat and deficient in circulation.

(9) *Skin and subcutaneous tissues.*—The symptoms of "itch" and the "mottling" of the skin have been described above. Subcutaneous emphysema, without trauma, is met with in a few cases during life and frequently in autopsies, especially along the course of the large veins of the extremities. Its presence as an accompaniment of contusions and punctured wounds I have several times demonstrated,

and it is doubtless due to the setting free of gas from the extravasated blood, for it is hardly likely that such an amount of compressed air could enter through the puncture.

(10) *Localized collections of gas.* aside from the small emboli scattered through the body, include the large collections found in the right side of the heart at autopsy (case cited below). At one autopsy which I witnessed there was a collection of about 5 cubic centimeters of gas beneath the mucosa of the jejunum. In two other cases I succeeded in aspirating about 1 cubic centimeter of gas from beneath the periosteum of the tibia, whose presence was evidenced by a soft cushionlike swelling in this area.[4]

(11) *Miscellany.*—In general, wounds bleed just as freely and heal quite as readily in the compressed air as in the normal atmosphere. Infections of the middle ear and of the sinuses which communicate with the nose are favored by the efforts of men to force open the Eustachian tubes during compression, which factor also accounts for most of the rather infrequent cases of epistaxis in caisson work. In use of the diving helmet, however, bursting of the air tube may cause epistaxis, ecchymoses, etc., by the cupping effect of sudden removal of pressure from the upper part of the body.[2]

Cystitis, pyelo-nephritis, myelitis, and meningitis may occur as the sequelæ of cord injury, but are not properly among the acute effects.

CONCLUSION.

In a paper so limited in time little more than an outline of the acute effects of aeropathy is possible. In conclusion, therefore, I would report what is, I believe, the first analysis ever made of the gases found in the right heart of a man who died from the effects of this disease, to wit:

On November 19, 1907, the author, with the assistance of Dr. J. E. McWhorter, collected 3.1 cubic centimeters of gas by aspiration from the right heart at the autopsy, 14 hours post mortem, of a man who died 1 hour after a 17-minute decompression, following 8 hours exposure to +30 pounds pressure. Upon analysis this gas yielded nitrogen, 80 per cent; CO_2, 20 per cent; which percentages are in accord with analyses made in animal experiments by various writers on this subject.

[1] F. L. Keays: Compressed Air Illness. New York, 1909.

[2] Leonard Hill: Caisson Sickness. London, 1912.

[3] Paul Bert: La Pression Barométrique. Paris, 1878.

[4] Seward Erdman: Aeropathy, or Compressed Air Illness Among Tunnell Workers. Journ. A. M. A., Nov. 16, 1907, Vol. XLIX, pp. 1665–1670.

[5] Heller, Mager, and von Schrötter: Luftdruckerkrankungen. Wien, 1900.

[6] Harlow Brooks: A Study of Blood Pressure in Compressed Air Workers. Med. Record, May 25, 1907. N. Y.

[7] C. J. Aldrich: Compressed Air Illness, or Caisson Disease. Med. News, N. Y., Nov. 26, 1904.

THE LATE MANIFESTATIONS OF COMPRESSED-AIR DISEASE.

PETER BASSOE, M. D., Chicago, Ill.

In this paper attention will be called to the ailments met with in compressed-air workers years after the exposure and acute manifestations. The material is practically the same as that which formed the basis of the article on compressed-air disease in the Report of the Commission on Occupational Diseases of Illinois (published in Chicago, 1911). An abstract of this report, read before the Chicago Neurological Society,[1] is as follows:

Some of the men examined had had their acute attacks many years ago; others during the present year. Of the 161 men, 87 had various affections of the ears, causing permanent impairment of hearing in 65 cases; 141 gave a history of "bends," that is, severe muscular and articular pains; 34 had paralysis, most generally transient and affecting the legs, although 3 men have permanent partial paralysis of one arm and 3 of both legs, and 11 present more or less chronic joint pain and stiffness. One of these men, who developed an affection of the hip immediately after working his second shift in compressed air 12 years ago, has been an invalid ever since and presents the typical X-ray picture of arthritis deformans. He had been in perfect health before these two exposures to compressed air. One man, with signs of caisson myelitis, had a spontaneous fracture of the patella 11 years after the acute attack, which had consisted of numbness in both lower extremities, followed by pain; 12 men now present signs of some degree of permanent cord disease; 13 were delirious or unconscious during the acute attack; 33 complained of vertigo as a prominent symptom; 6 of vomiting during the acute stage, and 11 of incontinence or retention of urine; 5 had numbness without paraylsis; 6 had "blind staggers," that is, labyrinthine vertigo with nystagmus; and 2 had "chokes." Several men gave a history of large swellings of the soft part of the chest wall or in the vicinity of joints. Bassoe had not seen them at this stage, but agrees with Heller, Mager, and Schrötter that the swellings are due to vasomotor disturbance of central origin—not to local liberation of gas (tumeurs gazeuses), as has been claimed by French writers. He considers the nitrogen-bubble theory of Paul Bert fully proved both by the observations on human beings and the abundant experimental work recorded in the literature. The cases treated by immediate "recompression" had fared much better than those not so treated.

In the spring of 1912 a number of these men were subjected to renewed and more thorough examination. They naturally group themselves into three classes, which will be taken up separately and illustrated by case records:

I. Cases in which spinal-cord symptoms predominate—caisson myelitis.

II. Cases of permanent joint affections, with the clinical and X-ray picture of arthritis deformans.

III. Cases of permanent ear affections.

Naturally, some men present symptoms belonging in two or all three of these classes, but, as a rule, one set of symptoms predominates.

CLASS I. CASES OF CAISSON MYELITIS.

GROUP A. CASES WITH SIGNS OF TROPHIC OSTEOARTHROPATHIES DEPENDENT ON THE CORD LESIONS.

CASE I (Illinois report, case 23).—*Attack of "bends," with numbness of legs and stiffness of knees, in 1898. Spontaneous fracture of patella in 1909. Porosis and atrophy of fragments. Fracture of external tuberosity of humerus in 1911. Signs of cord disease.*

Aged 40 years. Fourteen years ago he worked on Oak Street Water Tunnel, in eight-hour shifts. Pressure, 28 to 32 pounds. After working for a week, he had the first attack of "bends." Decompression, three and a half to five minutes. Five and a half hours later, taken with numbness and cold feeling in both lower extremities from the hips down, followed by severe pain for six or eight hours, and stiffness in the right knee. He returned to work in two days, and then the knee felt better, but it has never been well since. In January, 1909, on getting up from a chair, the right patella was fractured, and an abscess formed. He was laid up for five months. In August, 1909, he fell 4 feet and cut the skin over the right knee. On another occasion, on coming out from the lock, he had bleeding from the nose and ears. He returned to the lock and the trouble stopped. He has also worked on the Illinois Tunnel and the Four-Mile Water Tunnel without trouble. He denies syphilis, but admits gonorrhea. He states that from the time of the acute attack of "bends," until the patella was fractured, he had only slight pain.

Examination in October, 1910: Pupils normal. The right knee is stiff; there is a scar across it, and there is palpable evidence of an old fracture of the patella. Ankle jerks absent; left knee jerk absent; right knee jerk can not be tested on account of limitation of motion. On stroking the sole of the foot, extensor response of the right big toe is obtained, and flexor response on the left side. Sensation normal. No sphincter disturbance.

Dr. Hollis E. Potter took an X-ray picture of the right knee and reports the following findings: "Fracture of right patella at a point just below the middle of the bone. Diastasis of fragments of 2 inches. A third and smaller fragment lies between the two main portions. The lower fragment is elongated at the point of rupture. All surfaces of the fragments, as now seen, are rounded off, leaving no angles or corners. All fragments show porosis and bone atrophy."

In the spring of 1911 he fell on the floor, on his left hand, and sustained a fracture of the greater tuberosity of the humerus. He admits rather heavy drinking, which probably accounts for an enlargement of the liver, which was quite marked when he was reexamined in April, 1912. Then the right knee was found to be more freely movable, while there was slight limitation of motion at the right ankle. The knee and ankle jerks were now obtained on both sides, the former even exaggerated. The right knee jerk was stronger than the left, and the right-sided Babinski sign persisted. No ataxia. Sensation normal. Blood pressure equals 150 m. m. of mercury. Urine normal.

CASE II (Illinois report, case 59).—*"Bends" in right knee in 1890. Lame ever since. Looseness of patella with atrophy of bone. Disturbances of reflexes and sensation.*—(Cousin of Case I.) Aged 45 years. Twenty years ago he worked on the Four-Mile Tunnel, at pressure up to 25 pounds. He had several very light attacks of "bends" and then, after he had been in the tunnel, at pressure of 25 pounds, for about 25 minutes, he was taken with nosebleed, and, five minutes later, with bleeding from the left ear. He went out through

the lock in one or two minutes, and, on coming out, bled from both ears. While still in the lock, he had severe pain in the left temple and the left side of the forehead. After coming out, the pain was less severe, but he was dizzy. Twenty-four hours later he was taken with severe pain in the right knee, which lasted for seven months. He was in the Cook County Hospital, and two other hospitals, on account of the pain, which later particularly involved the left knee and left arm. Twenty-seven months after the onset he went to work as an elevator man in the Cook County Hospital. He did this work for three months and gradually improved. Three years ago he tried to work in compressed air at Gary, Ind. The pressure was 17 pounds, and he only worked one shift, as he got a peculiar sensation in the left arm. He still limps, dragging the right leg. In the spring of every year, he has more pain, and he then often has noticed that the right patella appears to be very loose. The left arm is numb in the region of the elbow. He has had no sphincter disturbance. He works most of the time, but can only do light work.

The watch is heard at 2 inches in the left ear, at 4 inches in the right ear. Wrist jerks are absent; the elbow jerks diminished; abdominal reflex not obtained. The right cremasteric reflex is stronger than the left, the knee jerks are increased, the plantar reflexes normal. The right-ankle jerk is diminished; the left, not obtainable. Both tactile and pain sense are moderately diminished in both legs, especially on the outer surfaces. The right lower extremity is 2 inches shorter than the left, and the circumference of the right thigh is 2 inches less than that of the left, while the circumference of the right calf is only one-half inch less than that on the left side. The right patella is slightly more movable than the left.

On account of the looseness of the right patella, the patient was referred to Dr. Hollis E. Potter for X-ray examination of the right knee. Dr. Potter's report is as follows: "The noticeable feature is a lateral widening of the upper face of the tibia, allowing a projection of one-half inch of this bone beyond the articular surface of the femur. It is difficult to account for this, since all profiles of both bones are smooth and regular, excepting a slight roughening of the inner condyle of the femur on its articular surface, suggesting cartilaginous loss. Slight atrophy of patellar borders."

Many years ago he injured the right eye in a dynamite blast, and the right pupil has been dilated ever since. Formerly the pupils were equal and the eyes normal in every way, according to the patient's statement.

Case III (Illinois report, case 37).—*Repeated attacks of "bends" for 27 years. Paralysis and incontinence in 1910. Signs of cord disease. Islands of atrophy and sclerosis in tibia.*—Seen October 1, 1910. Aged 46 years. He has worked in compressed air in various places most of his life since he was 17 years of age. Had "bends," lightly, in New York and New Jersey; worse in Cleveland, where the pressure was 48 pounds and where he worked in two-hour shifts, at intervals of four hours. After exit in four minutes he was taken with severe pain in the legs and arms, and was in a hospital for four weeks. He could not stand high pressure well afterwards; got the "bends" again, and left Cleveland. When working on the Four-Mile Tunnel into Chicago, at pressure of 27 to 30 pounds, he had slight "bends" after coming out through lock in about three minutes, and he had to lay off three days on account of the pain. In 1910 he worked at Hibbing, Minn., where an ore shaft was sunk. Pressure, 38 to 40 pounds. After his first shift of two hours, on January 20, he came out through the lock in about one and a half minutes, although the posted order of the company was that the time should not be less than 15 minutes. But there was a "green" lock tender. Immediately after exit he

had severe pain in the abdomen and extremities, could not walk, and at the same time the left eardrum was said to have ruptured, with bleeding from the ears. He was placed in the hospital lock, without relief; then he had a hot bath, and was placed in the hospital lock a second time. He was in the hospital for three weeks, and then stayed five weeks at the hotel unable to work. He could not walk for seven weeks after the onset, and had incontinence of urine and feces until a few months before being seen in October, 1910. Urination and defecation were still precipitate, and he still had some weakness and pain in the legs. He can not hear the watch on contact with the left ear; barely hears it with the right ear. Knee jerks normal or slightly exaggerated. Right ankle jerk absent (left not tested). He does not feel pin pricks in the legs and hands. He says that when examined at the hospital at Hibbing he could not feel pin pricks.

When seen again, in April, 1912, he had not been in compressed air since the previous examination. He has worked, but is troubled with pain in the right leg and occasional incontinence of urine and feces; of the former especially after drinking beer. The right leg sometimes "gives way" when he walks, but recovers after a brief rest. The right ankle is considerably stiffened, while there is normal range of motion in the other joints. There is now distinct analgesia only of the outer part of the left foot, and the outer aspect of the lower third of the left leg. No Romberg sign. Blood pressure equals 100 mm. of mercury.

X-ray examination by Dr. Hollis E. Potter fails to show any bony change to account for the stiffness of the right ankle. There is no change in the tibia within an inch of the ankle joint, but from this level and extending upward there are irregularly shaped islands of atrophy and of sclerosis in the interior of the bone. There is also mushrooming of the anterior portion of the astragalus into the scaphoid, resulting in flat foot.

GROUP B. VERY LIMITED PERSISTENT CORD LESIONS.

CASE IV (Illinois report, case 110).—*Two attacks in 1896. Permanent sensory loss in left ring and little fingers.*—Aged 52 years. About 1896 he worked for six months in compressed air at the Sixty-eighth Street Tunnel in Chicago. He had two attacks. The first one occurred after coming out from pressure of 20 pounds. He had severe bursting sensation in the head, nosebleed, ringing in the ears, and dizziness. On returning to compressed air he was considerably relieved, but, on coming out the second time, the ring and little fingers on the left hand became numb. He could move them, but they were evidently analgesic, as, four months later, a piece of flesh was accidentally torn out of the little finger without causing him any pain. The right heel also became numb in this attack, and remained so for about six months. He stayed away from work one week. The second attack occurred a month later, and consisted of similar sensations in the head. On returning to compressed air, he again improved. The condition of the affected fingers and heel was not changed by this attack. He lost two shifts. A few years later, he worked on the Oak Street Tunnel, and had no trouble, except that he was "blocked" a few times. He quit compressed-air work, and now works at a pumping station.

Examination in 1910 revealed diminished tactile, pain, and temperature sense of the left ring and little fingers and of the ulnar side of the hand and forearm, more so on the extensor surface. The wrist, elbow, knee, and ankle jerks were normal. The watch was heard at 8 inches on the left side, 12 inches on the right side, and he was then in good health.

When reexamined in June, 1912, he still complained of "sleepy feeling" in the same fingers and in the ulnar portion of the hand. The anæsthesia remained, and there was also loss of the sense of passive motion in the affected fingers.

CASE V (Illinois report, case 107).—*Attack of pain in right hand and forearm in 1898. Persistent analgesic area on forearm.*—Aged 39 years. In 1898 he worked on the Sixty-eighth Street Tunnel, Chicago, and, after working three months, he had an attack while at work at pressure of 18 to 24 pounds. He was taken with pain in the fingers of the right hand, which ascended to the elbow and was very severe. He went out through the lock in three or four minutes, which was unusually slow, and then became dizzy and had ringing in the ears. The pain remained about the same and lasted for five weeks. He went to work after 10 weeks, but not in compressed air, until working on the Thirty-ninth Street Tunnel about three years later. The pressure here generally was 12 pounds and he had no trouble.

The right arm has been a little weak ever since the attack, and occasionally after a hard day's work there is a "stitching" pain in it. On examination in 1910 the arm reflexes and tactile sensation in the arms were normal, but there was an analgesic area in the inner half of the upper third of the anterior surface of the right forearm. Knee and ankle jerks increased without clonus. Watch heard at 4 inches in the left ear and 10 inches in the right ear.

When seen again, in March, 1912, he said he had been forced to give up his work as bricklayer's tender because heavy lifting would cause pain and subsequent "falling asleep" of the right arm from the elbow down.

Three other cases of this kind will be placed in Class II on account of the more important joint lesions (Cases XII, XIII, XV).

GROUP C. CASES OF ORDINARY MORE OR LESS EXTENSIVE "CAISSON MYELITIS."

CASE VI (Illinois report, case 8).—*Onset in 1890. Persistent pain in the legs and precipitate micturition. Changes in the reflexes.*—Aged 54 years. Seen in July, 1910. He worked under compressed air on the Four-Mile Tunnel, Chicago, from 1890 to 1893, and had charge of the bricklaying. He had the "bends" three times. The first time after an 8-hour shift he came out from a pressure of 22 pounds in two or three minutes, although he had been advised by the engineer in charge to spend 10 minutes; but this precaution was seldom taken. In half an hour he was taken with severe pain in the knees, shoulders, and wrists, became dizzy, fell down on the street, and was picked up by a policeman, who thought he was drunk until informed by other workmen. He returned to work the next day. The second attack was similar, starting with pain in the knees, then he was dizzy and slightly dazed. He returned to work the next day. The third attack came on one-half hour after less than five minutes' decompressions, following an 8-hour shift in pressure of 33 to 35 pounds. He was taken with dizziness and pain in the knees. Was taken home, stayed in bed for about 36 hours; was not clear mentally; sat up in bed and "mumbled." He returned to work in a week, but the legs were weak and aching and the back was painful on stooping. No sphincter disturbance at first, but in a few weeks developed precipitate urination, which grew worse and became permanent. He had to give up work and was a patient in the Cook County Hospital from February to May, 1895. His case then seemed to have attracted considerable attention. He has never recovered, has suffered much pain, and walks very poorly. Had not been able to work at his trade since then, and has been idle most of the time, but at the time of examination had an easy position as

night watchman. He was in perfect health before working in compressed air, but has been a heavy drinker. On examination there is found opacity of the left cornea. The right pupil reacts to light. Hearing in the right ears is defective, the watch only being heard on contact. In the left ear it is heard at 3 inches. He can not get the right heel down to the floor, except when the left heel is raised. The left knee jerk is considerably exaggerated, the right about normal. Both ankle jerks are diminished, the left more so. Arm reflexes normal. Sensation normal. He died suddenly in 1911.

CASE VII (Illinois report, case 155).—*Four attacks of "bends," one associated with transient paralysis of both legs and retention of urine. Increased reflexes and sensory disturbance.*

A young man, 24 years old, was seen in November, 1910, at St. Louis, where he was working in caissons for the new bridge. He had worked in compressed air since 1903. The first attack was in 1907, and came on after working at a pressure of 22 pounds. The decompression lasted 7 minutes, and 10 minutes later he was taken with severe pain in the left knee. He was well in 2 days, and had the second attack 6 months later, after coming out from a pressure of 28 pounds, in 10 minutes. He had pain across the abdomen, and "knots" formed in the abdominal muscles. Both legs were paralyzed for 2 hours, and he had to be catheterized for 2 weeks. For the next 6 months, there was some dribbling of urine, and ever since the legs "fall asleep" easily. He returned to work in a month and worked two 3-hour shifts at a pressure of 30 pounds in one day. After coming out from the second half, in 10 or 12 minutes, he was immediately seized with pain in the abdomen. He took a bath, and was then suddenly taken with extreme dizziness, tinnitus, and nausea. He could not see plainly; everything seemed to whirl around. He did not vomit until a physician gave him medicine, which he thinks was an emetic. He was in the hospital for 10 days, could walk after 4 days, but some dizziness remained for two months. Tinnitus and complete deafness were present the first 3 days, and hearing has never been normal since. Then he had a couple of attacks of "bends" while working on two bridges in Arkansas. The first one was slight, and affected the hips; the second one was rather severe, affected the left arm, and he did not fully recover for a week. Since February, 1910, he worked on the bridge at St. Louis, and in April, while working two daily 2-hour shifts at a pressure of 40 pounds, he had an attack. Decompression lasted 15 minutes, following which he was taken with pain in the left hip, which lasted all night, and was finally relieved in the hospital lock, but he had to go in and out four times. Aside from these definite attacks he has frequently had some burning in the skin of the abdomen and of the left arm after coming out. This has occurred as a regular thing when the pressure was high. He has also frequently been dizzy for about 10 minutes after coming out.

Watch heard in right ear at 3 feet; in the left ear not heard on contact, but C–2 tuning fork heard. Both knee and ankle jerks are exaggerated and there is reduced pain sensation in the left leg.

In this connection the following case is of interest, as showing how repeated attacks, with severe acute symptoms, may fail to produce any permanent disease:

CASE VIII (Illinois report, case 147).—Aged 36 years; foreman. Seen at St. Louis in November, 1910, where the following record was made: Has worked in compressed air for 10 years, much of the time as foreman or

superintendent; has made his own rules, and has stayed much longer in, and come out more quickly from, the compressed air than the ordinary laborers are permitted to do.

The first attack occurred in Texas, in 1905. He stayed in a caisson, which had sunk, for 1½ hours, at a pressure of 53 pounds, and came out in about 5 minutes. Then stood out in the cold air for awhile, and, after 15 minutes, suddenly became paralyzed from the waist down. He had no pain, could not move the legs for 8 days, had to be catheterized for 10 days, and required enemas to move the bowels. He then improved rapidly, but had severe pain in the knees and ankles for 4 days after recovering from the paralysis. He had full control of the bladder after the retention ceased, but there was burning on micturition for some time. The catheter had not been boiled, and had been passed by a "sand hog." The next attack occurred in Arkansas, one year ago, after he had spent 12 consecutive hours in a pressure of 40 pounds. He came out as rapidly as the valve would permit, and had severe pain in the right shoulder for 2 days. He had no trouble when working on the Traction bridge at St. Louis, but has had two attacks while working on the new bridge since last February. The first one occurred on the Illinois side last September. He spent 7 hours at a pressure of 51½ pounds, and came out in 3½ minutes, while the time prescribed for the men was 35 to 40 minutes. Five hours later, when in bed, he was taken with slight pain in the knees, and 1 hour afterwards became paralyzed from the waist down. He was placed in the hospital lock 45 minutes after the onset of paralysis, and movement returned in 35 minutes. He stayed in the hospital lock for about 18 hours, and then was perfectly well, and returned to work. The second attack also occurred on the Illinois side on October 25. He stayed in a pressure of 45 pounds for several hours, came out in 3 to 5 minutes, when, half an hour later, he was taken with pain in the right shoulder. He used hot applications without any benefit, and 2 hours later he went to the hospital lock, where he remained for 17 hours, during which he had no relief at all, and, after coming out, he was worse than before. The arm is still weak and hurts a little. There was no swelling. Reflexes and sensation in both arms normal. Knee jerks brisk.

CLASS II. CASES OF PERMANENT JOINT DISEASE OF THE TYPE OF ARTHRITIS DEFORMANS.

In the course of this investigation, several cases were met with in which chronic arthritis of one or more joints had developed as a sequel of "bends" in the vicinity of the joints affected. The histories are so explicit on the point of the origin of the joint trouble in attacks of articular pain immediately following exposure to compressed air, that it seems that an etiologic relationship must exist. In some of the cases (XII, XIII, XV), acute cord symptoms as well as persistent ones were present, so as to make it possible that we are dealing with the osteoarthropathies previously considered, while, in others, it seems simpler and more reasonable to assume that the joint changes are the result of trauma to the articular structures by the local liberation of air, a well-recognized and common phenomenon.

CASE IX (Illinois report, case 47).—*Typical arthritis deformans of right hip. Onset in 1899, after working only two shifts.*

Aged 69 years; carpenter. Twenty years ago he worked on the Four-Mile Tunnel in Chicago without trouble. Eleven years ago he did some carpenter work in the Oak Street Tunnel, and worked two 8-hour shifts under pressure of about 30 pounds, from which he came out rapidly. On the way home from the last one he got pains in the legs, which became extremely severe and lasted all night. He says that he was blue all over the body, and that the physician could not feel his pulse. The blueness disappeared after rubbing the skin. He went to work in 4 days, but the legs were weak, especially the right one. He has walked lame ever since, on account of pain, which is chiefly felt in the right groin, and comes on especially when he starts walking. A year after the onset, he saw the late Dr. Christian Fenger, who put on an extension apparatus for 10 weeks. Then he felt worse, and had to use crutches for a year. He has not worked since this time. He never had any rheumatism, and was in perfect health before this occurrence. The knee jerks are brisk, the ankle jerks normal. Sensation and plantar reflex in the right leg normal. He had no sphincter disturbance, but now has to get up nights to urinate. There is an apparent lengthening of the right leg, which he says has been present ever since the extension apparatus was used.

Dr. Hollis E. Potter took an X-ray picture of the right hip, and reports the findings as follows: "All changes are compatible with an arthritis deformans of the hip joint, namely: The head of the femur is flattened and mushroomed; the neck of the femur appears shorter and wider; cartilaginous space decreased; osteophytes laid down at edges of cartilage, acetabulum, and head of femur."

The above notes were made in October, 1910. When last seen, in May, 1912, the condition of the hip remained the same. The distance from the anterior superior spine to the inner malleolus was the same on both sides; but that from the umbilicus to the inner malleolus, was 1.5 centimeters greater on the right side. There was limitation of motion in the right hip in all directions.

CASE X (Illinois report, case 115).—*Attack of "bends" in 1901, at once followed by pain in the right knee and, a couple of years later, by pain and stiffness of the right hip. Typical advanced arthritis deformans of the latter.*

Aged 48 years. In 1901, he worked on the Thirty-ninth Street Tunnel without trouble. Then in Cincinnati for 3 months in 1902. His first shift was 6 hours, at a pressure of 50 pounds. He came out through 2 locks, spending 5 minutes altogether. One and a half hours later he was taken with severe pain in the right knee, chiefly located at the inside of the patella. It was severe for 3 days. Neither hospital lock nor a bathtub was available. He has had more or less pain in the right knee ever since. He became unable to bend the knee fully, and could walk only a few blocks. He worked as a bricklayer until 1905, and since then has been a masonry inspector for the city. He has been in compressed air occasionally, but has had no further attack. Two or three years after the actute attack he also developed pain in the right hip, and this joint gradually became stiff. He has been considerably better during the last one and a half years, and ascribed the improvement to massage. Examination revealed marked limitation of motion in the right hip. The knee and ankle jerks are exaggerated, slightly more so on the right side. Sensation in the lower extremities is normal, but he complains of occasional sen-

sation of "pins and needles" in the soles of the feet, and sometimes the fingers become white and feel a little numb. When standing long, the pain in the hip and knee gets worse, and the thigh feels numb. X-ray picture of the hip taken by Dr. Max Reichmann, in 1912, shows the joint partly obliterated by bony hypertrophy along the acetabular margin and at the base of the head of the femur.

There is plastic overgrowth of bone at the upper margin of the neck. There is slight upward wandering of the acetabulum, compatible with shortening of one-half inch. The condition is typical of advanced arthritis deformans of the hypertrophic type, secondary to an atrophic state.

CASE XI (Illinois report, case 72).—*Attacks of bends and vertigo in 1905. Since then, repeated joint swellings, X-ray findings typical of arthritis deformans in knees and ankles. Areas of atrophy and sclerosis of bone in right fibula.*

Aged 41 years. In 1905 he worked for nearly a year as timekeeper at the East Boston Tunnel. Pressure variable; maximum, 26 pounds. After working 10 weeks he had the first attack after coming out from a 4-hour shift at 26 pounds in 8 or 10 minutes. Immediately after exit he was taken with dizziness, bleeding from nose, ears, and eyes, pain in the knees and ankles, and across the small of the back. He was taken home in a carriage and stayed in bed for four weeks, during which the pain was continuous and very severe, especially in the back. He could move the legs, but could not get up on account of the pain. Urination was slow, followed by dribbling, and has remained so. Sexual power not affected. Some dizziness and tinnitus; the latter, especially in the right ear, has persisted. He returned to work in 6 weeks, but could do very little. Two weeks later, after coming out in 10 or 12 minutes from a pressure of 24 pounds, he was again taken with dizziness, nosebleed, and pain in the kness and back. He stayed in bed 3 weeks. After another week he went to work, but never returned to compressed air, and has worked as a salesman and insurance agent. He has become generally nervous, suffers considerably from pain in the back and knees, headache, and tinnitus, the latter particularly during colds. Occasionally there is swelling of the knees and ankles, all of which joints became swollen within a few hours of exit from the lock at the time of attack. These joints now become swollen about once a month, usually all four at a time, and the swelling lasts from a few days to two weeks. The watch is heard in the right ear at 6 inches, left at 12 inches. Knee and ankle jerks normal. There is much tenderness about the knees, and a grating is felt when the patellæ are moved.

When last seen, in June, 1912, he stated that he had been in bed for a month during the winter on account of pain and swelling of the knees, ankles, and hands. Grating in the knees, especially the right one, was still present.

X-ray pictures of the right knee, as interpreted by Dr. Hollis E. Potter, show deposition of bone at the upper anterior surface of the patella, "lipping" of the tibia anteriorly, and external displacement of the tibia on the femur, the joint surfaces not being in perfect apposition. The right ankle shows fragments of bone at the extreme lower end of the fibula, but it is not clear whether they are derived from the fibula, astragalus, or ossified ligaments. The lower half inch of the fibula shows irregular areas of atrophy and sclerosis. The left ankle shows little change, merely slight atrophy of the extreme tip and inner surface of the fibula adjacent to the astragalus. The hands show no changes.

CASE XII (Illinois report, case 111).—*Attack of "bends" in 1896, both shoulders affected. Now pain and stiffness of left shoulder. Anesthesia over left scapula.—X ray shows arthritis deformans of left shoulder.*

Aged 43 years. First seen in October, 1910. About 20 years ago worked as a bricklayer on the Four-Mile Tunnel, Chicago. Pressure, 18 to 21 pounds. He worked 7½ hours a day at one stretch. One attack occurred after coming out in 3 to 3½ minutes. He first had twitching in the muscles of both arms, and half an hour later severe pain in the same locality, which lasted for about 8 hours. The next attack occurred in 1896, after he had been working for 2 weeks on the Cleveland Tunnel. He came out in about 2½ minutes from a pressure of 34 pounds, in which he had worked continuously for 9 hours. At once he was taken with severe pain in the chest and both shoulders. He went back in the lock for 2 hours, during which he was relieved, but, after coming out the second time in 4 or 5 minutes the pain returned. Then he was again relieved by staying in a warm bath for 6 hours, but the pain returned and lasted about 4 days. He then returned to work, and had no pain while in compressed air, but ever since this attack, when not in compressed air, he has frequently had twitchings and pain about both shoulders and across the chest.

The trouble is now diminishing, and he has it only occasionally, when resting after a hard day's work. It is now felt only in the left shoulder. He is now a sewer inspector. He had no rheumatism of any kind before this attack. He denies syphilis, but admits gonorrhea. Examination reveals considerable limitation of movement in the left shoulder. He can not raise the arm fully to the vertical position. The arm reflexes are normal. There is a triangular area of tactile anesthesia above the spine of the left scapula. The temperature sense is also diminished in this area and downward to the level of the angle of the scapula. Pain sense is lost in the triangular area, but is not affected as far downward as is the temperature sense. Sensation on the arm and chest normal.

When reexamined in 1912 the findings were practically the same, the anesthetic area extending from the edge of the trapezius nearly to the angle of the scapula.

X-ray examination of the shoulder by Dr. Max Reichmann shows the head of the humerus to be enlarged and porotic. There is great irregularity in the joint surfaces, and the rim of the glenoid cavity is greatly overgrown with bone.

CASE XIII (Illinois report, case 5).—*Pain in legs and paralysis in 1897. Limitation of motion in hips. Articular pains since onset. Altered reflexes.*

Aged 48 years. Bricklayer. In 1897 he worked in compressed air during the construction of a water tunnel at Rockford, Ill. The pressure was 39 pounds, and he worked in two long periods. He thinks decompression lasted about five minutes, as only 1½-inch valve was used. After coming out from his third shift he was immediately taken with pain in the legs, walked to his boarding house, became paralyzed in the legs, and was taken to a hospital in Rockford, where he remained for 3 days, during which there was much pain. He was then taken back to Chicago, but could not walk at all for 6 months. During this time he could move the legs a little, but every movement caused pain, and the muscles often felt "as if tied in a knot." There was no sphincter disturbance at first, but about a year and a half later micturition

was slow and rather painful for a time. He has never been entirely free from pain since the acute attack, and had to give up bricklaying altogether. The pain affects the knees, thighs, and hips, and is generally worse in the autumn of every year. He has done a little work as inspector for the city and some light work in tunnels, but recently he has been quite lame and unable to do any work. Of late he has had considerable edema of the legs.

The pupils are equal and react normally. The knee jerks are slightly increased. The ankle jerks can not be obtained, while the wrist and elbow jerks are increased. Abdominal and cremaster reflexes normal. Sensation normal. Considerable stiffness, pain, and limitation of movement in both hips. The strength in the muscles of the legs is fair. Heart normal. The urine contains considerable albumen.

CASE XIV (Illinois report, case 58).—*In 1899 attack of pain in legs; vertigo. Rupture of ear drum and persistent deafness; left knee still painful.*

Aged 43. Seen in October, 1910. He first worked under pressure of 9 to 15 pounds, on the Illinois Tunnel in 1899. On one occasion, when pressure was 19 pounds, he had a bursting sensation in the ears while in the lock and had bleeding from both ears, nose, mouth, and eyes. He became extremely dizzy and partly unconscious; was carried out and taken to the Polyclinic Hospital, where he stayed for 3 days, during which time he was very dizzy. The left drum was found to be ruptured. The bleeding lasted for about an hour and a half, when there was purulent discharge from the left ear for 6 or 7 months. He also had pain in the limbs and back and had to be helped to raise himself in bed. He had much backache for 4 months, and for 2 years there was tinnitus, like the ringing of bells. Hearing in the left ear has been lost ever since. Three years ago he worked in compressed air at Clinton, Iowa, but he had to give it up on account of dizziness and queer feeling in the head. Both knees, especially the left, have been quite stiff ever since his first attack. He had then returned to work in 6 months, shoveling earth, but had to quit in less than a week on account of pain in the knees, arms, and back. The left knee is now painful on passive movement and on tapping the patella. The knee jerks are normal. The left ear is totally deaf; not even a C–2 tuning fork is heard. Watch heard in right ear at 1 foot.

CASE XV (Illinois report, case 160).—*Ear trouble since "blocked" in 1898. Three attacks of "bends" in 1901. Still often pain in knees and ankles. X ray of left knee shows islands of sclerosis in tibia and thickening of surface of tibia. Diminished sensation and decreased reflexes in legs.*

Aged 35 years. First seen in October, 1910. In 1898 he worked on Illinois Tunnel; pressure, 18 pounds. Bled from right ear when going through lock the first time. He returned to work the next day, but had tinnitus for a week, and the right ear has been slightly deaf ever since. Whenever he had a cold this ear would trouble him when he went into compressed air. In 1901 he worked for one year in Cleveland (Ohio) Water Tunnel, where he had three attacks. The first one occurred after he had been working for 3 weeks. One hour after very rapid decompression, following an 8-hour shift at 37 pounds, he was taken with pain in both legs, "like a sword tearing up and down the flesh," which lasted 18 hours. He was out of his head on account of the pain; "would have killed himself if he had had the chance." He was given plenty of hot whisky and returned to work in 5 days. Two other men were

affected at the same time. The second attack occurred 3 weeks later after quick decompression following an 8-hour shift at 27 pounds. He returned to the lock on account of severe pains similar to those of the first attack and improved rapidly. Went out again slowly and was able to return to work the next day. Four weeks later he had the third attack, which came on less than 1 hour after coming out rapidly from a pressure of 27 pounds. He had to go to a cold room, although, according to the rules, a warm one should have been provided. He had pain like that of the previous attacks.

In 1907, he worked for three months at Clinton, Iowa. In the course of the work, the pressure was gradually raised to 27 pounds. After coming out from a four-hour shift, with wet feet, on account of leaking boots, he was taken in three-quarters of an hour with the same kind of pain as before. He returned to the lock, remained one hour, came out slowly, and was well. He did not return to work there, but, in 1909, he worked on the Northwestern Depot, Chicago, at pressure of about 18 pounds. He was "blocked" a few times, but had no other trouble.

He now works in open caissons, and is in good health, with the exception that the legs are often stiff in damp weather. He never had this trouble before the attack of "bends."

Watch heard at 1½ inches in the right ear; 4 inches in the left.

When seen again, in June, 1912, he still complained of pain in the knees and ankles in changeable weather, "in the same place where he had the bends." The knee and ankle jerks were sluggish, and both tactile and pain sense seemed to be reduced from the knees down. The patient has seven children, and denies veneral disease.

Dr. Hollis E. Potter made X-ray examination of the knees. Two inches below the left knee joint there are changes in the spongy tissue of the tibia in the shape of irregularly branching or stellate islands of sclerosis. Dr. Potter is of the opinion that this appearance is caused by a reconstruction of the bone, following an atrophic process. There is also a bulging thickening in the surface of the tibia just below the head of the fibula. The right knee shows no change.

GROUP III. EAR AFFECTIONS.

As stated, 87 of the 161 men gave a history of ear affections, and 65 have more or less impairment of hearing. Thirty-three complained of dizziness. Rupture of the drum, which, according to the large experience of Koch [2] and of Chrabrostin [3] is rare, was said to have occurred in our cases III and XIV, related elsewhere in this paper, and in one other case. However, we only have the patients' statements that they were so informed by doctors, who might have drawn the erroneous conclusion that hemorrhage from the meatus indicated rupture of the drum. Such hemorrhage had taken place in a large number of cases.

Eight of the men with more or less marked permanent deafness were referred to Dr. G. W. Boot for otological examination. In every one a diagnosis of labyrinthine deafness was arrived at. In five of these men marked nasal obstruction was present, caused by deflected septum or enlarged turbinates, which furnishes a reason for

the liability of these men to be "blocked" on entering the caissons. Four of them state distinctly that the ear symptoms came on after decompression, which harmonizes with the labyrinthine character of the deafness. However, according to Heller, Mager, and Schrötter,[4] the general experience has been that "decompression is of no importance in caisson workers when the ears are healthy." The presence of nasal obstruction in so many of our men, therefore, becomes significant, as the ears may have been diseased beforehand, and as such obstruction would render equalization of pressure by means of free passage of air through the Eustachian tubes extremely difficult.

CASE XVI.—*Eighteen years ago partly "blocked" on entrance. After decompression, pain in ear, vomiting, vertigo, total deafness for a time. Persistent tinnitus and partial deafness.*—Aged 36 years. In 1904 he was partly "blocked" on entering pressure of 27 pounds. Two and a half hours after coming out he was taken with pain in the left ear, vomiting, vertigo, and delirium. He was delirious for several days, during which there was considerable bleeding from the left ear, and, later, discharge of pus. There was total deafness at first, but soon hearing was partly restored. He has never been in compressed air since then. Left-sided tinnitus has persisted, and he often feels dizzy. Dr. Boot examined him in June, 1912, and reports:

"Whisper in right ear heard at 30 cm.; in left ear, loud whisper heard only close to the ear. Bone conduction much shortened. Weber to the left. Low limit: Hears 32 with each ear. C–4 shortened in the left ear. Upper limit: R., 20,000; L., 19,000. Throat normal. Nasal septum deflected to the right. Right tympanic membrane lusterless, position normal. Left retracted, luster good. Irrigation of the right ear with cold water gives rotary and horizontal nystagmus to the left. Irrigation of the left ear with cold water gives rotary and horizontal nystagmus to the right, chiefly rotary. Hearing improved by inflation. Diagnosis: Tubal occlusion. Labyrinthine deafness."

---

[1] Journal of Nervous and Mental Diseases, June, 1911.

[2] Koch: Festschr. Friedr. Wilhelmsinst., Berlin, 1895.

[3] Chrabrostin: Official report on work under water to Russian Navy Department, 1882. Cited after Heller, Mager, and Schrötter: Die Luftdruckerkrankungen.

[4] Loc. cit., p. 1003.

CAISSON DISEASE AND ITS PREVENTION.

HENRY JAPP, M. Inst. C. E., M. Am. Soc. C. E.

The prevention of caisson disease is a very important subject to engineers and contractors, as the State regulations imposed with this object in view are becoming more and more restrictive.

Caisson disease has resulted in an ever-increasing cost of operation by bringing about reduced hours of labor, increased pay, and a limited supply of labor.

The hours of labor are reduced to minimize the chances of disease, the pay is increased to overcome the fear of disease, and the supply of labor is limited by medical exclusion to prevent disease.

It is therefore evident that if caisson disease had been understood and prevented, that at least two of these factors, the decreased hours and the increased pay, would not have been so necessary.

There is nothing novel in working in compressed air, as we were born under these conditions, and live under a varying air pressure which, for those who travel over mountainous regions, may vary as much as 4 or 5 pounds per square inch.

The greatest range of air pressure on the earth's surface is from the top of Mount Everest to the bottom of No. 3 shaft of Calumet and Hecla mines, or from about 5 pounds absolute pressure to 17½ pounds, or a range of 12½ pounds, as shown on figure 1.

The pressure of the atmosphere at sea level is 14.7 pounds, and this pressure is taken as zero in steam or air pressure gauges registering pressures above atmosphere, generally referred to as gauge pressure or +, while the pressure of the atmosphere or chamber above a perfect vacuum is called the absolute pressure.

A drop in absolute pressure from 17½ pounds to 5 pounds is a fall of 71½ per cent, which is no safer than in dropping from 51½ pounds absolute to 14.7 pounds, or a 71½ per cent fall. That is to say, it is possible, on the earth's surface, to encounter as hazardous conditions as obtain in working in an air pressure of 36¾ pounds gauge.

If one could be elevated from the earth's surface to a height of 40,000 feet in a few minutes, caisson disease would be almost certain, and no doubt some of the unaccountable accidents in flying are due to the effects of decompression caused by a too rapid ascent.

Until balloons were invented, it was possible to reach rarified atmosphere only by climbing, which, even by railroad, is comparatively slow; so that, although mountain sickness is common, aggravated cases of caisson disease or "bends" are not on record.

It is now generally accepted that caisson disease is caused by the nitrogen of the air becoming absorbed or dissolved by the blood and tissues when under air pressure, and becoming liberated as bubbles during and after decompression.

Under atmospheric pressure, the blood and tissues carry a definite weight of absorbed nitrogen, and if the air pressure is increased they will absorb a definite increase of nitrogen in proportion to the pressure, while if the pressure is decreased they can only hold a decreased quantity of nitrogen and the surplus is given off in bubbles. Just in

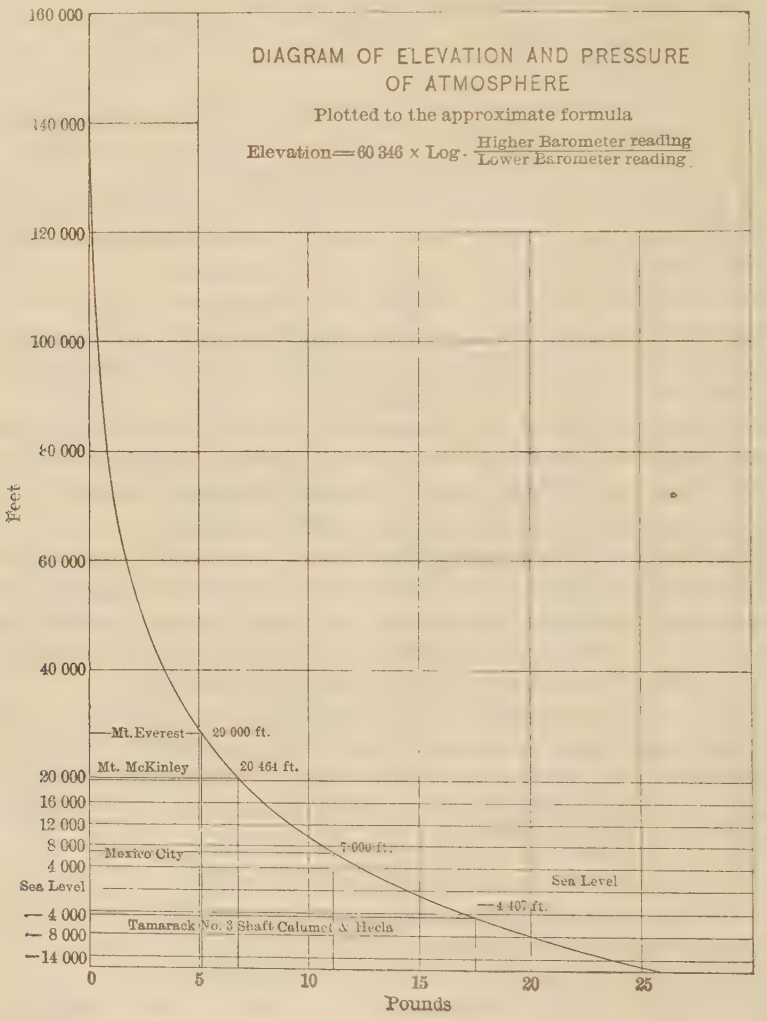


FIG. 1.

precisely the same manner as the water under pressure in a bottle of aerated water carries a definite quantity of carbonic-acid gas in proportion to that pressure, and, if the cork is released gently, the pressure falls and gradually the surplus gas in the water escapes until equilibrium is again restored. If, on the other hand, the cork is

allowed to blow off, the sudden reduction of pressure causes the absorbed gas to escape suddenly, frothing up the water in doing so. Similar changes occur in the blood and tissues of a man on decompressing.

The earliest successful attempts to cure the "bends" consisted in restoring the original pressure to prevent the expanding bubbles from tearing the tissues, and these attempts were made instinctively by the men themselves. Following out the same thought, the bubbles which caused the pain were prevented from reappearing by reducing the pressure gradually.

Paul Bert was the pioneer who first suggested the application of this principle, not only to the cure of caisson disease, but also to its prevention.

For years the workmen cured themselves by returning to the caisson, and Dr. Smith, of New York, suggested the substitution of a recompression chamber which Mr. Moir, without knowledge of Dr. Smith's prior suggestion, put into use by building the first recompression chamber or medical airlock in 1890 for the old Hudson Tunnel. The medical airlocks used on the East River tunnels of the Pennsylvania Railroad were also designed by Mr. Moir, and are shown in figure 2.

The success of the medical airlock on the Hudson Tunnel reduced the death rate due to caisson disease from 25 to 1 per cent, and that, combined with the increased knowledge of the disease, kept the death rate on the Pennsylvania East River tunnels down to nineteen hundredths of 1 per cent, showing that a considerable advance had been made in the cure and prevention of the disease. From the observed effects of slow decompression in the medical airlock, combined with the suggestions of Paul Bert, it has gradually become apparent that the rate of decompression is of the utmost importance.

The writer had the good fortune to be the managing engineer for S. Pearson & Son (Inc.), the contractors on the four East River tunnels for the Pennsylvania Railroad, on which there were at one time as many as 10 headings under air pressures varying from 15 to over 40 pounds gauge pressure. The maximum number of men employed, including surfacemen, was 2,500, and more than 4,000 cases of caisson disease were cared for.

Some valuable results were obtained from this great undertaking, as the medical force was very desirous of studying this interesting subject in all its phases, and they have written excellent papers which are valuable contributions to our understanding of caisson disease.

The results of our experience show that, although it is not possible, from a practical point of view, to altogether prevent caisson disease, yet it can be kept within control.

Starting the work with the benefit of all the literature on the subject, and the great experience that Mr. Alfred Noble had gained under very high air pressures, combined with Mr. Moir's experience

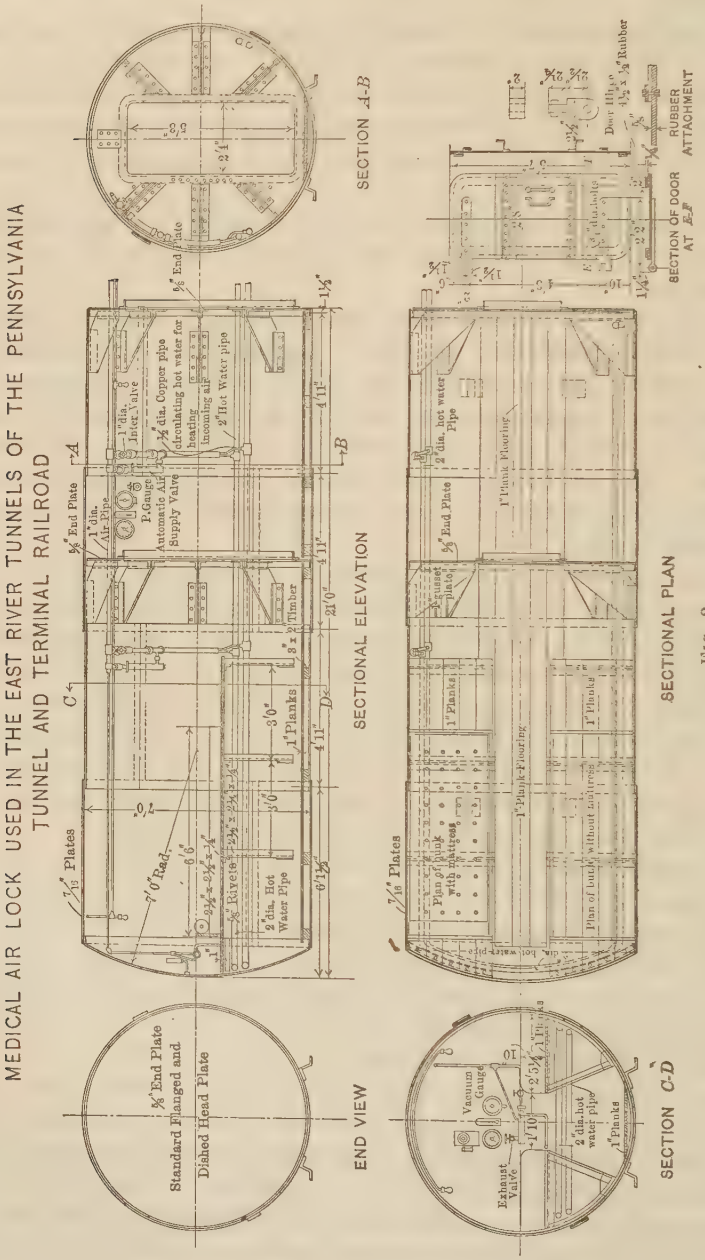


Fig. 2.

in the caissons of the Forth Bridge, the old Hudson Tunnel, and the Blackwall Tunnel, we considered we were well equipped for the work.

Regulations for the guidance of the men (Appendix 1) were printed in six languages, and posted on the works, and we gradually developed a system, by the time the pressure reached 36 pounds, which was approximately as follows:

Under the supervision of our chief medical officer, Dr. Frederick L. Keays, each applicant was examined physically by the medical officers (of which there were five), and, if sound, he with others was tested in a tunnel under pressure for 1½ hours under the care of a competent man. After decompressing, in 15 minutes he was again examined, and if no bad results were noticeable, he was allowed to go to work on the next shift for one-half a spell, and, if no symptoms developed, he was allowed to complete the remaining spell.

The shifts consisted of eight hours in air pressure up to 32 pounds gauge pressure, divided into spells by an interval of half an hour for lunch in atmosphere, or between locks at a lower pressure.

Above 32 pounds gauge pressure, the shift consisted of 3 hours work in air, 3 hours off in atmosphere, resting, and 3 hours work in air, which was in force up to 42 pounds pressure, above which the pressure never rose.

After completing the shift, the men were decompressed in large air-locks by the lock tender or foreman for a period of 15 minutes for pressures up to 35 pounds, and, in order to make the decompression automatically at a regular predetermined speed, decompression valves (fig. 3) were fitted in each lock.

In order to insure that the men who entered the air chamber were duly certified by the medical officers, each workman wore in sight a brass shield bearing a number under which he was registered by the doctor and the timekeeper.

Number checkers were stationed at the tunnel entrances, who booked the number of each man and refused admittance to anyone who had not a doctor's pass. These same number takers booked the time for decompressing, and the numbers of the men coming out, and reported directly to the writer, so that the rule of 15 minutes for decompression was strictly enforced. Hot coffee was provided free for the men, and warm dressing rooms were connected by covered passages with the elevators and the doctor's office, where the medical airlocks were located. The greatest number of fatal cases of "bends" occurred before all these regulations were enforced, and before the tunnels had progressed far enough to permit of two sets of airlocks with differential pressure—but, even after everything possible was done, fatal cases occurred.

It was not until after Dr. Haldane's investigations for the British Admiralty had demonstrated that a diver could descend in 210 feet of salt water, or 92.4 pounds gauge pressure, and, after decompressing by the stage method, would suffer no ill effects, that we were able to work in high pressures without fatal cases resulting.

Dr. Haldane's description of his work in conjunction with Dr. Boycott and Lieut. Damant is most interesting.

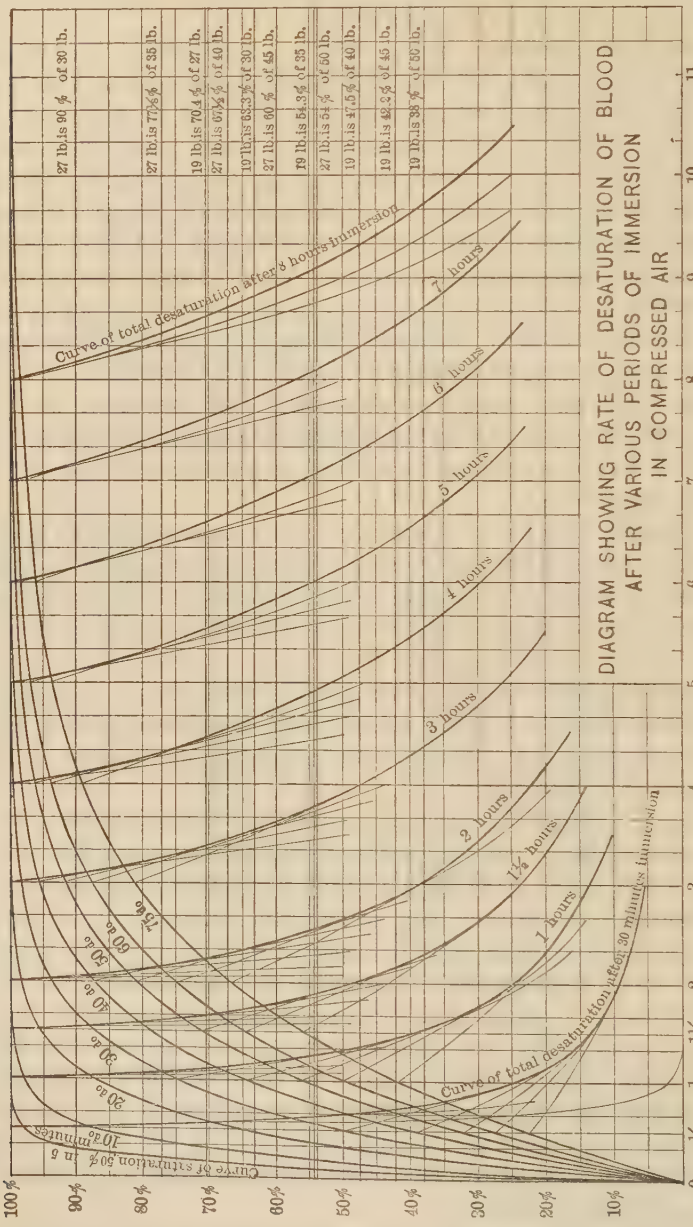


DIAGRAM SHOWING RATE OF DESATURATION OF BLOOD
AFTER VARIOUS PERIODS OF IMMERSION
IN COMPRESSED AIR
Hours
Curve of total desaturation after 8 hours Immersion
7 hours
6 hours
5 hours
4 hours
3 hours
2 hours
1½ hours
1 hours
Curve of total desaturation after 30 minutes Immersion
75 lbs.
60 lbs.
50 lbs.
40 lbs.
30 lbs.
20 lbs.
10 lbs. 5 minutes
Curve of saturation 50 % in 5 minutes
27 lb. is 90 % of 30 lb.
27 lb. is 77 % of 35 lb.
19 lb. is 70.4 % of 27 lb.
27 lb. is 67½ % of 40 lb.
19 lb. is 63.3 % of 30 lb.
27 lb. is 60 % of 45 lb.
19 lb. is 54.3 % of 35 lb.
27 lb. is 54 % of 50 lb.
19 lb. is 47.5 % of 40 lb.
19 lb. is 42.2 % of 45 lb.
19 lb. is 38 % of 50 lb.
100 %
90 %
80 %
70 %
60 %
50 %
40 %
30 %
20 %
10 %

FIG. 8.

Briefly, he noted that no fatal cases occurred for rapid decompression up to 19 pounds gauge pressure, or 2.3 atmosphere absolute, and concluded that it was safe to decompress rapidly to 44 per cent.

of the absolute pressure—to be conservative, he calls this 50 per cent— and if, after reaching 50 per cent of the absolute pressure, the decompression continues slowly enough to keep the maximum air saturation of the body not more than 2.3 times the pressure in the airlock, there will never be any danger.

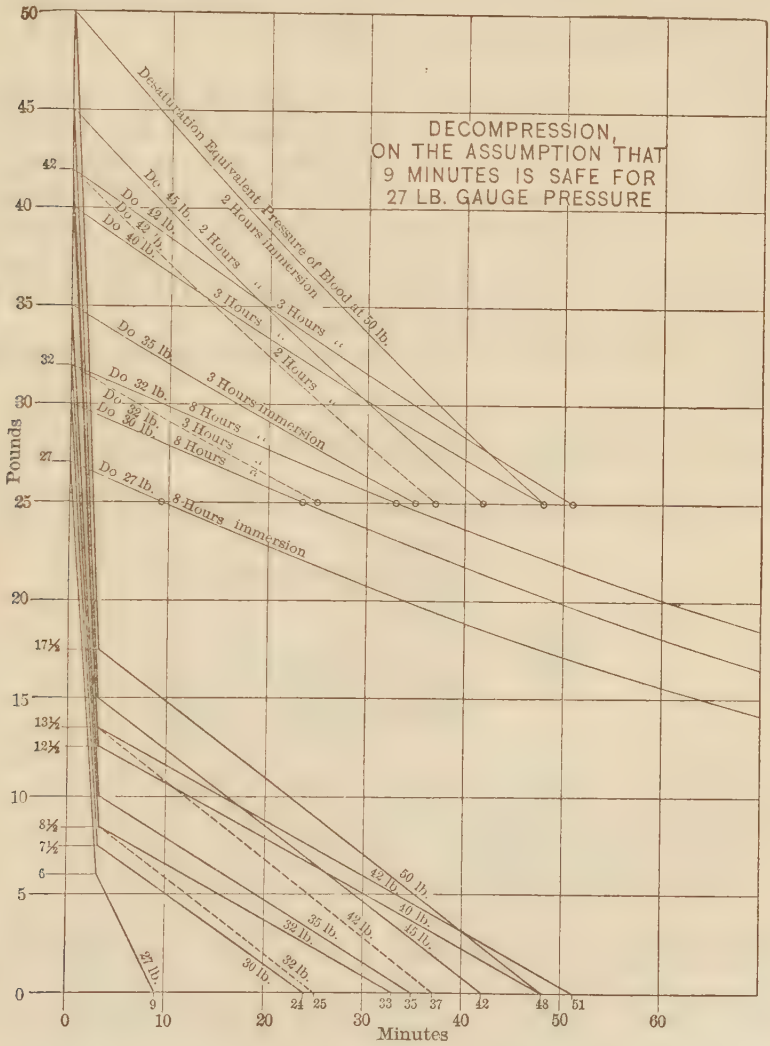


FIG. 5.

After many experiments on goats and men, Dr. Haldane concluded that the blood and tissues saturate and desaturate at the same rate in relation to the difference in pressure, and, from Dr. Haldane's results, the writer has plotted fig. 5, which shows the rate of saturation of various parts of the body which absorb nitrogen at rates varying from 50 per cent in 5 minutes to 50 per cent in 75 minutes.

On the same chart are shown the combined rates of desaturation for all parts of the body after periods of immersion varying from 30 minutes to 8 hours.

This diagram might be called the " sand hogs " chart.

On this basis it will be seen that 90 per cent saturation does not take place until after four hours' immersion for the slowest parts of the body, while the quickest parts become saturated 100 per cent in 40 minutes.

Dr. Haldane contends that the air is absorbed by the blood as it passes over the lung surface, and as it circulates through the body it gives up part of its charge of air to the unsaturated tissues and flesh and receives a fresh charge of air at each passage over the lung surface. So that, where the circulation is rapid and the number of blood vessels high for the mass, the saturation will be rapid, and in the same way, during desaturation, the blood will carry off the air and give it up on passing over the lung surface.

From his observations he drew up the following table for caisson workers:

TABLE 1.—*Dr. Haldane's rate of decompression in caisson and tunnel works.*

[Extract from report of a committee appointed by the Lords of the Admiralty on deep-water diving, August, 1907; Eyre & Spottiswoode.]

Working pressure per square inch.	Number of minutes for each pound of decompression after the first rapid stage.		
	After first 3-hour exposure.	After second or third 3-hour exposure, showing an interval for a meal.	After 6 hours or more of continuous exposure.
Pounds.	*Minutes.*	*Minutes.*	*Minutes.*
18–20	2	3	5
21–24	3	5	7
25–29	5	7	8
30–34	6	7	9
35–39	7	8	9
40–45	7	8	9

For example, if the pressure is 40 pounds gauge, decompress rapidly in 3 minutes to $\frac{40+15}{2}=27\frac{1}{2}$ pounds absolute, or $12\frac{1}{2}$ pounds gauge; then take 7 minutes for each pound remaining, or 87.5 minutes, plus 3 minutes$=90\frac{1}{2}$ minutes in all. On the upper diagram of figure 6 the writer has plotted this graphically, which shows that the absolute pressure in the airlock is never allowed to fall to less than 44 per cent of the pressure in the blood.

Dr. Haldane suggests that, where possible, a portion of the tunnel should be maintained at a constant pressure of half the absolute

pressure in the working chamber, and that the men decompress to this pressure in three minutes, and continue in this intermediate or

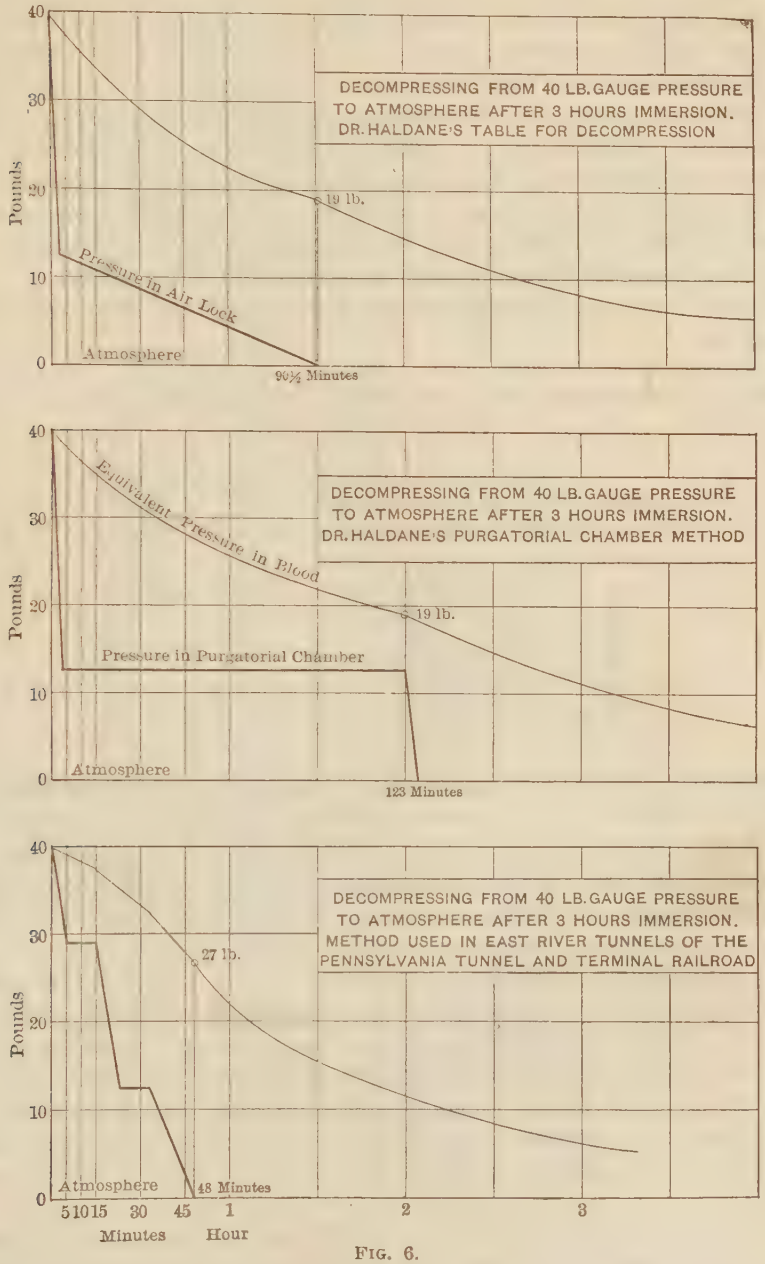


FIG. 6.

"purgatorial" chamber until the pressure in the blood falls to 19 pounds gauge, and then come out in three minutes. It is obvious that this will take longer than in the previous method and the middle

diagram of figure 6 shows this graphically, the time required being 123 minutes.

It will be noticed that Dr. Haldane bases his theory on the fact that no fatal cases have occurred below 19 pounds gauge pressure, and, as he has proved his case for very deep diving, the writer concluded that as only a very few cases of death are recorded up to 25 pounds pressure, and in his experience, none below 29 pounds, it was reasonably probable that a system of decompressing which never allowed the pressure in the airlock to fall to less than 37 per cent of the maximum air saturation of the body, would meet the case from a practical point of view, as the times suggested by Dr. Haldane are very long, especially when applied to small locks and caissons.

Figure 7 was therefore plotted and Table 2 was drawn up from the diagram.

TABLE 2.—*Decompression table based on 25 pounds maximum air saturation of body on emerging.*

Gauge pressure	Reduce pressure in 3 minutes to—	Total time in airlock after 8 hours work.	Total time in airlock after 3 hours work.	Total time in airlock after 2 hours work.	Maximum air saturation of body on emerging.
Pounds.	*Pounds.*	*Minutes.*	*Minutes.*	*Minutes.*	*Pounds.*
27	6	9	.....	.....	25
30	7½	24	.....	.....	25
32	8½	33	25	.....	25
35	10	.....	35	.....	25
40	12½	.....	48	.....	25
42	13½	.....	51	37	25
45	15	.....	.....	42	25
50	17½	.....	.....	48	25

Before this table was drawn up, and some little time after reading Dr. Haldane's paper, it became necessary to raise the pressure in the tunnels to 40 pounds gauge. Fortunately, it was possible to make the men pass through three sets of airlocks, and, without fully understanding Dr. Haldane's theory, we tried to apply it. The men were ordered to take 5 minutes in the first lock, decompressing from 40 pounds to 29 pounds; then followed a walk of 1,000 feet in 29 pounds, which required about 10 minutes, including waiting for the airlock and the stragglers. Eight minutes were spent in the second airlock, where the pressure fell from 29 pounds to 12½ pounds, or half the original absolute pressure; another walk of 1,000 feet, or 10 minutes, elapsed at this pressure, and the third lock reduced the pressure to atmosphere in 15 minutes, or 48 minutes in all.

The lower diagram on figure 6 shows that the maximum air saturation of the body in the men, on emerging to the atmosphere, was 27 pounds gauge, so that they did what seems to be the equivalent of coming out of 27 pounds air pressure instantaneously, and no

severe or fatal cases resulted under these conditions. Three hundred and thirty men were employed for 36 days, working 3 hours on, 3

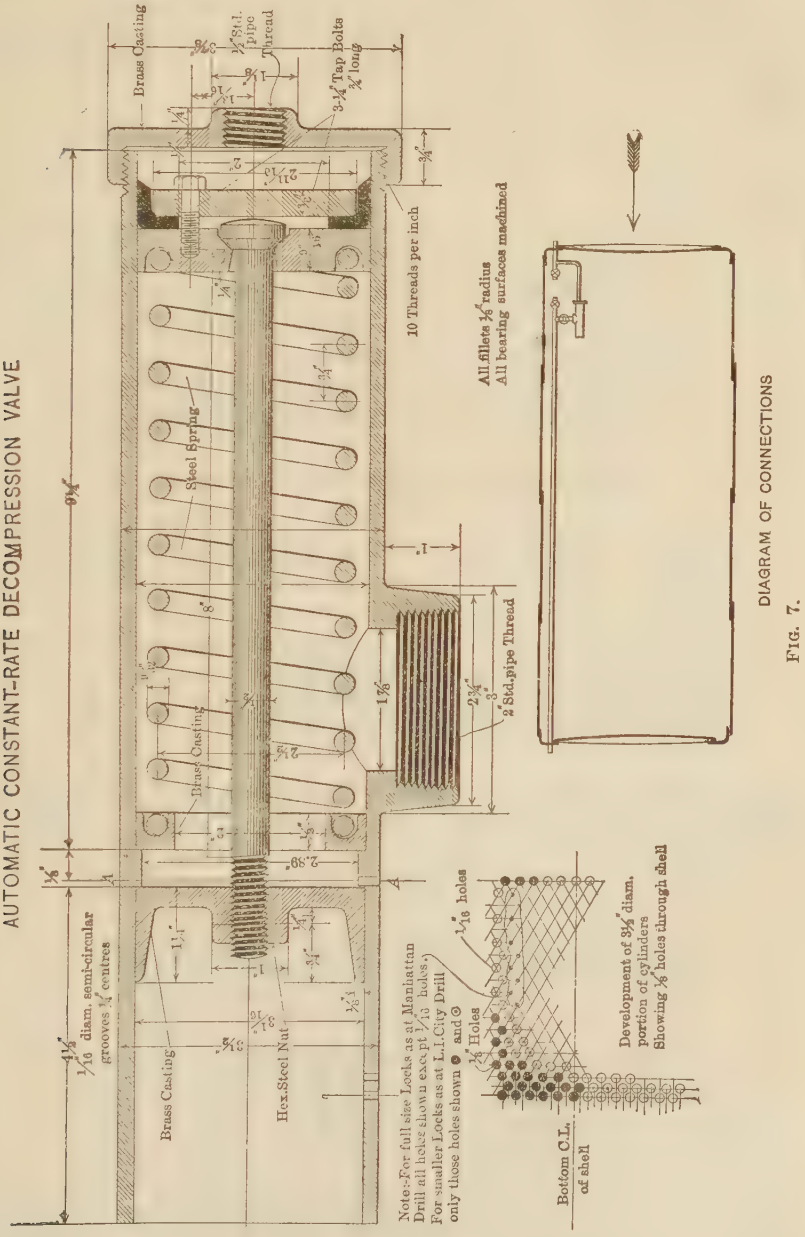

AUTOMATIC CONSTANT-RATE DECOMPRESSION VALVE
Brass Casting
Std. pipe Thread
3-¾" Tap Bolts ¾" long
10 Threads per inch
All fillets ⅛" radius
All bearing surfaces machined
Steel Spring
Brass Casting
2 Std. pipe Thread
Brass Casting
Hex. Steel Nut
1⅛" diam. semi-circular grooves ¼" centres
Note:-For full size Locks as at Manhattan Drill all holes shown except 1/16 holes. For smaller Locks as at L.I. City Drill only those holes shown ● and ⊙
1/16 holes
¼" Holes
Development of 3½" diam. portion of cylinders Showing ⅛" holes through shell
Bottom C.L. of shell
DIAGRAM OF CONNECTIONS

FIG. 7.

hours off, and 3 hours on, representing over 23,000 individual decompressions without a mishap.

It is true that only seasoned air workers were used at this high pressure, but, even so, it was a great improvement on our previous experience. If we had decompressed on the basis of Table 2, we would have still required 48 minutes, but the maximum air saturation in the body would have been reduced to 25 pounds gauge pressure, instead of 27 pounds.

While the writer would recommend Table 2, it is difficult for a number of engineers, doctors, and contractors to agree on any such lengths of time.

The commissioner of labor of the State of New York, Mr. Williams, called upon those interested in compressed-air work to submit their views to enable him to draft a law for regulating compressed-air works, and, with his permission, the suggestions of 21 men interested in this work are shown on Appendix 2.

Instead of embodying these recommendations in the new law, however, the regulations shown in Table 3 were adopted.

TABLE 3.—*New York State law for air work.*

Gauge pressure.	Time under pressure.	Interval between spells.	Uniform decompression.
Pounds.			*Minutes.*
0–28	8 hours less interval	30 consecutive minutes spent in open air.	18¾
28–35.99	2 spells of 3 hours each	At least 1 hour	24
36–41.99	2 spells of 2 hours each	At least 2 hours	42
42–45.99	2 spells of 1½ hours each	At least 3 hours	46
46–49.99	2 spells of 1 hour each	At least 4 hours	50

In order that this new law may be compared with the suggested stage method in Table 2, these are compared in Table 4.

TABLE 4.—*Comparison of uniform and stage decompression.*

Tunnel pressure (gauge).	Time worked.	Uniform decompression (New York State law).	Maximum air saturation of body on emerging.	Stage compression (based on Table 2).	Maximum air saturation of body on emerging.
Pounds.	*Hours.*	*Minutes.*	*Pounds.*	*Minutes.*	*Pounds.*
28	3¾ and 3¾	18¾	25.70	14	25
36	3 and 3	24	30.25	36	25
41.99	2 and 2	42	31.25	37	25
45.99	1½ and 1½	46	32.00	35	25
50	1 and 1	50	32.50	33	25

The law, while remaining as above for tunnels, has since been modified as regards decompression for caissons, as shown in Table 5, and goes into effect September 1, 1912.

The Air Workers' Union stipulate the times of work in caissons:

3¾ and 3¾ hours	To 22 pounds pressure
3 and 3 hours	To 33 pounds pressure
2 and 2 hours	To 35 pounds pressure
1½ and 1½ hours	To 40 pounds pressure
⅔ and ⅔ hour	To 45 pounds pressure

TABLE 5.—*Time of decompression for caissons, New York State law.*

	Time of decompression (in minutes).
Up to 10 pounds pressure	1
Up to 15 pounds pressure	2
Up to 20 pounds pressure	5
Up to 25 pounds pressure	10
Up to 30 pounds pressure	12
Up to 36 pounds pressure	15
Up to 40 pounds pressure	20
Up to 50 pounds pressure	25

It will be seen that the new law, which is based on uniform decompression, compares very unfavorably with the stage method, requiring generally much longer time to decompress and leaving a higher degree of saturation in the body. In other words, it is inconsistent in requiring 6 minutes for 9 pounds pressure and permitting what appears to be the equivalent of instantaneous decompression from 32.5 pounds.

What has always puzzled the writer is that a physically perfect man may continue working in high pressures daily without being subject to the disease and one day, under apparently similar conditions, he is attacked with a fatal case.

It seems logical to assume that some change takes place in the ability of the body to free itself of air bubbles in cases where strong men have worked daily for months under high air pressure without any symptoms; then, under precisely the same conditions, to all appearances, have suddenly succumbed to a severe attack of "bends," the blood on post-mortem examination being found frothed up with air bubbles.

The writer is too ignorant of physiology to know the possible changes that may take place in the blood and tissues of the body, but he suggested to one member of the medical staff of the East River tunnels that a valuable discovery might result from an investigation of the capacity of blood and tissue to absorb and give off nitrogen when in different conditions such as acid and alkaline, or with different relative numbers of red and white corpuscles, with various kinds of germs in the blood, and any other change that could be thought of.

It is fairly safe to assume, in these strange cases, that some change has taken place in the body, somehow, that it has a greater capacity

for absorbing air, and that it gives it off more quickly than normally, in fact, too quickly for the body to get rid of it without damage.

Some time ago, the writer was very much interested to read that it was accepted by some of the medical profession that a man's mental condition produced changes in the secretions of the body, anger or fear producing noticeable changes which may possibly make one susceptible to caisson disease, in the same way that fear of yellow fever makes a man more susceptible to the disease. The writer noticed that the men who declared that caisson disease could not hurt them were singularly free from it. One superintendent, in particular, who insisted on coming out from all pressures with a 3-inch valve full open, never, as far as we know, had caisson disease.

This side of the question might well repay investigation.

Dr. Leonard Hill read a most interesting paper on "Compressed-air illness" before the British Association for the Advancement of Science at Sheffield, in 1910, and calls attention to the fact that the unstudied conditions which control bubble formation in supersaturated solutions are of the first importance.

He has proved, by his experiments on animals, that the varying percentage of fat in blood, chyle, liver, and the gaseous contents of the guts, are factors of importance; ill health, a debauch, and rich feeding modify these conditions.

In conclusion, he says, for caisson workers, that one stage at +15 pounds would suffice up to +50 pounds, and suggests that exercise and oxygen can be used to shorten the pause at +15.

He suggests a pause of 15 minutes at +10 pounds for +30 pounds working pressure, and 30 minutes at +15 pounds for +45 pounds working pressure, and says that this would probably suffice, so long as a medical air lock for recompression is at hand.

There is no doubt that much can yet be discovered by painstaking investigations, such as Dr. Hill and Dr. Haldane have already undertaken, and it would be a great help to the engineering profession if the International Congress on Hygiene and Demography could draw up a table for decompression within practical bounds, as a guide for future legislation.

APPENDIX 1.—*Pennsylvania East River tunnels regulations for men working in compressed air.*

1. All men must be examined by the medical officer before commencing work in compressed air, and must not enter the air lock until passed by him. His advice should be taken in all cases of illness or accident, which should be reported to him immediately.

2. All men must wear the doctor's pass badge where it can be seen by the timekeeper and lock tender.

3. No man should enter the air lock when sick or with an empty stomach.

4. After an attack of illness all men must report to the medical officer before returning to work in the tunnels.

5. No nuisance will be permitted in the tunnels. A water-closet on the surface is provided for the use of workmen. The bladder should be relieved before entering the tunnels, and all workers are strongly advised to see that their bowels are opened every day.

6. All men are advised to use intoxicating liquors sparingly or, better, not at all, and to drink water sparingly while in the tunnels.

7. Get fully 7 hours' sleep every 24 hours, if possible.

8. While in the lock, as the pressure is raised, it is recommended to clear the passage between the ears and throat by continual swallowing.

9. After coming out of the lock all men are advised to drink warm coffee freely, and to put on dry warm woolen clothing.

10. Avoid exposure to cold, and do not exercise unduly for one hour after leaving the lock.

11. Smoking in compressed air is dangerous and not permitted.

By order:

S. Pearson & Son (Inc.).

The above regulations are written in the following languages: English, German, Italian, Slavic, Hungarian, Polish.

Appendix 2.—*Proposed rules to be observed in work under compressed air.*

[Submitted to the Commissioner of Labor of the State of New York by twenty-one engineers, doctors, and contractors.]

1. *Medical examination.*—Before being allowed to start work in compressed air, all men should be examined and pronounced physically fit by the medical officer. In the event of a man being absent from work for more than three days owing to a sickness, he shall not resume work in compressed air until he has been reexamined and passed. When a man is suffering from any ailment he should report himself to the medical officer, whose advice he shall follow.

2. No alcoholic liquors will be allowed on the work.

3. The workmen shall be supplied with hot coffee free of charge.

4. The contractors will also provide for the men: Warm dressing rooms, bathroom with hot water, medical air lock.

5. *Analysis of air.*—Sufficient air shall be pumped into tunnel heading so that the percentage of CO_2 shall not be greater generally than one-tenth of 1 per cent above that of the air being compressed, and, in order to insure good ventilation, the air-supply pipes shall be carried as near to the face as may be practicable and necessary.

6. Persons working in compressed air must be able to communicate with the power plant on the surface at any time through suitable signal apparatus.

7. *Periods to be worked in various pressures.*—Up to 20 pounds gauge pressure, two 5-hour shifts at the face may be worked. From 20 up to 32 pounds gauge pressure, 8-hour shifts may be worked, with half an hour off for lunch. From 32 to 40 pounds gauge pressure, six hours at the face shall be worked, divided into two shifts of 3 hours each.

The periods to be taken for coming out of the various pressures shall be as follows:

One-stage decompression.—15 pounds gauge pressure, 1 to 3 minutes; 20 pounds gauge pressure, 3 to 4 minutes; 25 pounds gauge pressure, 5 to 8 minutes; 30

pounds gauge pressure, 10 to 15 minutes; 35 pounds gauge pressure, 15 to 20 minutes; 40 pounds gauge pressure, 25 to 30 minutes.

Two-stage decompression.—25 pounds gauge pressure (outer lock), 3 to 4 minutes; 30 pounds gauge pressure (outer lock), 6 to 8 minutes, with 5-minute interval between locks; 35 pounds gauge pressure (outer lock), 8 to 10 minutes, with 10-minute interval between locks; 40 pounds gauge pressure (outer lock), 12 to 15 minutes, with 15-minute interval between locks.

Pressure between locks to be approximately half the gauge pressure at the face.

The men will be held responsible for the due observance of the above rules.

DISCUSSION.

Dr. Julius Grinker, Chicago: Regarding the remote effects of caisson disease, my experience extends only to spinal-cord diseases, in which I failed to see any improvement at all. In the cord, the pathology is practically that of embolism and thrombosis of blood vessels and the prognosis is usually bad, in contradistinction to the conditions such as Menier's disease which Prof. Frankl-Hochwart states have improved after years. Here, as elsewhere, the rule holds good that once the cord is destroyed, it remains permanently so.

TUESDAY AFTERNOON, SEPTEMBER 24, 1912.

THE EFFECTS OF EXPOSURE TO INTENSE HEAT ON THE WORKING ORGANISM.

Surg. CHARLES N. FISKE, United States Navy.

The navy has been consulted. I take it, in the matter of affections caused by heat and other attending conditions of the atmosphere in which its men work, because this class of disability has attracted attention in the public press and in occasional medical reports, either in time of war or in the course of cruises, in which the reading public is more or less interested by reason of prostrations and deaths being noted in published dispatches.

The accompanying statistical table records but 20 deaths and 32 invalidings from the service on account of heat stroke during the past 35 years, and the damage curve would indicate that heat prostration has been of comparatively little importance to the service as a whole; however, from the excerpts from sanitary reports of naval medical officers to follow, and the fact that considerable numbers of cases have on occasion jeopardized the strategic or diplomatic mission of a particular warship, the deep concern of the immediate hygienist will appear to be justified.

Heat prostrations were coeval with the "new Navy" of the past quarter century which found its beginning in the famous "white squadron;" correspondingly as that early class of all steam-propelled cruisers and gunboats has been retired, and its lessons in sanitation, and notably in ventilation, have been used profitably in the design and equipment of all but the earliest class of battleships and armored cruisers, the factor of heat stroke in the Navy has assumed relatively a very low value during the past few years.

Naval hygienists who have agitated changes in construction, arrangement, and ventilation of ships will represent that the service has largely solved the problem, while other observers will, with perhaps equally good reason, maintain that the difficulty has solved itself on account of smaller boilers and more economical leads of steam pipes and arrangements of pumps in the engine rooms of large ships. The latter view, however, is refuted by the still lower location of dynamo and steering-engine compartments, and, in the main, it will be evident that improved facilities for ventilation, whether

natural or artificial, have achieved the subsidence of heat prostration. It is only when a radically new type of ship is placed in service that faulty and inadequate ventilation any longer occasions suffering and disability from undue atmospheric heat and humidity, as has recently been shown to occur on the first ships of the *Dreadnaught* type.

At their worst, heat affections have developed only on isolated occasions, and then only on comparatively few ships, and, in the absence of severe cases, many have doubtless been so trivial that they have hardly been recognized as of such a nature.

This statement must prepare the physiologists and pathologists among you who look for some apology or explanation for the naval surgeons' not making more definite contributions and exact observations relating to the Navy's fairly typical cases of heat exhaustion; it is perhaps thought that with their training, time, equipment, and peculiar opportunity to study the condition at its inception, something more than a mere compilation of general data should be available from the reports of naval surgeons for this paper. Such versatility, however, as the wide range of duties demands of naval medical officers, together with the lack of experience and apparatus to make the precise observations which would enable physiological study to withstand criticism, and the uncertainty of having the cases which nearly always occur under the unusual and unanticipated conditions on a ship in the Tropics, remote from laboratories, as well as the fact that these occasions are likely to find the doctor most busy, preclude the contributions for which we all seek, and which should be more practicable near steel mills, for instance, where cases may frequently be expected, and where they may be provided for such study.

The perusal of literature of disorders attributed to heat tends first to confuse the student as to nomenclature and terminology and almost hopelessly as to etiology. In the naval reports comparatively few titles have been used; probably fewer than if more had been available on the printed classification, and save for the quotations from the text of the reports themselves little dependence can be had upon just what train of symptoms a title was used to cover some 15 years ago, when heat affections were most prevalent in the Navy. For these reasons I have combined in the table all heat cases without regard to prevailing nosology.

One of the earliest references to heat prostration in the firerooms of ships, published by an American naval surgeon, is the following by Medical Inspector A. L. Gihon in his Naval Hygiene of 1872:

> The symptoms of insolation often occur among men not exposed to the direct rays of the sun—in the fireroom of steamers, on board the monitor class of armored vessels, in small, ill-ventilated cells. Dr. Kitchen informed me that while surgeon of the monitor *Dictator* it was common for men to be brought to him for treatment with coma, stertorous breathing, great heat of skin, full, quick pulse, and often convulsions. The cause was manifestly enough the

exhausting labors of a watch in the fireroom, where the temperature averaged 145° F., and where the ventilation was exceedingly defective, air that had been already respired being repeatedly returned. Maclean states that "insolation has frequently been observed on board ship, but almost always under conditions similar to those in barracks—that is, where overcrowding and impure air added to the influence of excessive heat. Insolation is not uncommon on board the mail steamers in the Red Sea in the months of August and September. It has been observed that most of the cases occurred while the sufferers were in the horizontal position in their ill-ventilated cabins," and he quotes the following: "Assuredly," says Dr. Butler, surgeon of the Third Cavalry, "those barracks most crowded, least ventilated, and worst provided with punkahs and other appliances to moderate excessive heat furnished the greatest number of fatal cases. Surg. Longmore, of the Nineteenth Regiment, notes that one-third of his cases and nearly half the deaths occurred in one company of the regiment quartered in the barrack which was manifestly the worst conditioned as to ventilation, and indeed in every sanitary requirement. M. Bassier, a surgeon in the French navy, reports that the man-of-war brig *Le Lynx*, cruising off Cadiz, in the month of August, had 18 cases of insolation out of a crew of 78 men. The heat was excessive (91–95° F.) and much aggravated by calms. The ship was overcrowded, offering little space for the berthing of the crew. M. Boudin quotes the case of the French man-of-war *Duquesne*, which, while at Rio de Janeiro, had 100 cases of insolation out of a crew of 600 men. Most of the men were attacked, not when exposed to the direct heat of the sun, but at night when in the recumbent position—that is, when breathing not only a hot and suffocating but also an impure air."

The works of Surg. Joseph Wilson, United States Navy, 1870, Medical Directors T. J. Turner, 1879, and A. Gorgas, 1897, and Medical Inspector H. G. Beyer, 1908, include but passing references to heat affections.

Medical Inspector J. D. Gatewood, in his Naval Hygiene, 1909, writes:

About 90 per cent of all troubles ascribed to heat come from a part of the service—the engineer force in cruising ships—serving under conditions that put a large load on the kidneys, while depriving them of the fluid necessary to flush themselves properly. The result is a great concentration of irritating urine and perhaps even anuria, if, while the body is bathed in warm sweat, there is a sudden checking of perspiration and rapid chilling of bodies under ventilators or fans. If during the year 1905 all the firemen and coal passers had been at sea the entire time, there would have been about 200 admissions for heat troubles from each 1,000 firemen and coal passers so employed, and in the year 1899 about 400, other conditions remaining the same.

The intensity has relation, however, to atmospheric conditions while under way, the course of the ship in relation to wind, high outside temperature with high relative humidity, and relative state of calm producing the maximum result. The hearts and kidneys and stamina of men, if much speed is maintained, are then greatly tried, especially if new men, some perhaps not well selected, are working as coal passers. It would therefore seem that in a general way tropical cruising, especially in our summer months, and an increasing percentage of recruits in the engineer force, tend to that condition in the service known as heat prostration. For instance, the records show that in 1898, when, owing to the Spanish-American War, there were relatively a large number of recruits and several summer months of general tropical cruising, though

chiefly at reduced speed, the admission ratio for cruising ships was 29.4. At present the nature of the so-called heat prostrations in firerooms is not well understood. It appears that when men are working in hot air they are able to perform their duties without much distress when the standing of the wet-bulb thermometer is not much above 81° F., but when that bulb approaches 86° to 88° F. the disinclination to work becomes very marked. However, the form of heat prostration may not be due to the direct condition of contained air as shown by thermometer readings, but may be precipitated by rapid variations of skin temperature incident to exposure to drafts under ventilators in natural ventilation or to currents incident to assisted or forced drafts when applied to a fireroom already containing men who have been subjected to very high temperatures.

At any rate it has seemed that the tendency to heat prostration has become quite marked at times just after assisted draft has been started. It may be considered that if firerooms were kept under assisted draft the cases of heat cramps would be greatly diminished, but that the use of assisted draft only occasionally to meet special conditions may be responsible for a number of such cases at some particular time.

The air of firerooms has probably always been of sufficient chemical purity, so far as adequate oxygen and minimal carbon dioxide are concerned, and there is no evidence that carbon monoxide from the furnaces or coal oxidation on the floors has accumulated to produce any such toxic symptoms as are commonly attributed to heat. That this distress tending to heat prostration is a matter of heat and humidity, preventing automatic cooling of the body by evaporation of sweat and by convection to circulating air, as shown last year by Mr. Leonard Hill, of London, was surmised years ago is indicated by the following extracts from sanitary reports:

Surg. George H. Cooke, reporting on the U. S. S. *Mohican*, in 1885, said:

> It was while cruising along the Mexican coast during the rainy season (July and August) and in the warm water and hot murky weather of that region that numerous cases of prostration from heat occurred, as well among the men on deck as with those in the fireroom.

Surg. John C. Wise, on the U. S. S. *Jamestown*, in 1886, said:

> Two deaths occurred during the year—one, a case of insolation, happened when the thermometer stood at 85° F., showing the importance of care in this respect, especially when there is great atmospheric humidity, which so often prevails in the West Indies.

There are probably few medical officers who would now fail to affirm the belief of Chevers, Manson, Castellani, and other eminent authorities, that of the predisposing causes of heat stroke alcohol habituation, or even occasional alcoholism, is one of the greatest factors; and while I personally believe the Navy would be almost infinitely better off if total abstinence could be enforced and the Medical Department and messes of ships quite as well administered if no spirituous, vinous, or malt liquors were permitted on board ship, still, given men who frequently indulge, that there is another

side to the practical question is evidenced by the following opinions and practices of former naval surgeons.

Passed Asst. Surg. G. P. Lumsden, reporting on the U. S. S. *Boston*, en route from New York to Jamaica and Central America, October, 1888, says:

The firemen complained of the heat of the fireroom, which had a temperature of 140° F., and several cases of heat exhaustion occurred; the first on the 6th, the second day out from Sandy Hook. After this 1 ounce of whisky was given each fireman who brought a card from the engineer, at the end of his watch. This seemed to have a beneficial effect, as there were fewer complaints after this, and they appeared to work more cheerfully. At Port Royal 15 gallons of Jamaica rum were purchased by order of the captain, upon the recommendation of the surgeon, which was served out in 1-ounce doses, as stated above, and it lasted until within a few days of New York.

Surg. E. H. Green, on the U. S. S. *Marblehead*, reported, in 1894:

The temperature of this (berth) deck, with the dynamo running, was from 90° to 92° F., rendering it almost impossible to obtain refreshing rest. The fireroom has had a temperature as high as 140° B. [the author observed it 186° F. July 13, 1906]. Usually it is 120° F., the engine room being from 105° to 110° F. There were several cases of heat exhaustion, though none of them of a serious nature. While cruising in the Tropics it was found necessary to give stimulants at the end of each watch. One and one-half ounces of rum were given, and it had a good effect, as it kept the men up to their work, looking forward to the dram at the end of the watch, and it restored the exhausted system very materially.

Surg. Howard E. Ames's report, on the U. S. S. Detroit, for 1895, says:

It is here I will make a few remarks upon the engineer's force, based upon observations made upon this vessel, and which, I think, apply to the whole service. The modern warship is a series of small compartments, demanded for strength and security. This compartment system is followed in the coal bunkers. When under steam in hot weather these bunkers are not properly ventilated, and, in addition to this, the heat is too great. The deficiency of fresh air is not so serious a defect as the high temperature which surrounds the men while working. During the summer we were up the Yangtse River, and during that trip the temperature of the coal bunkers ranged from 115° to 127° F., while the outside temperature on deck was from 95° to 100° F. If the engineer's force is expected to maintain its efficiency, it is important that some scheme be devised to overcome this excessive temperature. It is absurd to expect nature to overcome a temperature of 28° F. under such conditions, and no human being can work efficiently in such a temperature without permanent injury to his physical and vital constitution. Take, in addition to the heat, the motionless, impure air of the bunkers, filled with coal dust, constantly clogging the sweat glands of the men, and a moment's thought will picture their deplorable condition. During the trip it was only by giving each fireman and coal passer 2 ounces of whisky at the end of his 4-hour watch that we were able to keep them at work and accomplish the trip. We had several cases of heat prostration, none of which was fatal. The men at the end of the watch were almost collapsed, streaming with perspiration, accompanied by stertorous breathing, rapid pulse, and trembling limbs. The 8 hours' rest was not sufficient to restore them sufficiently to consider them efficient men.

This exhaustion was not due to the work, but to the abnormal conditions surrounding the workers. This is shown by the weight of the coal handled on this trying trip. The general consumption during one day was 26 tons, the daily average for the trip being 18 tons. If we admit that this average was handled twice, it would give us but 36 tons handled in 24 hours by 30 coal passers, or 1.2 tons per day per man, and this work was not continued beyond four hours. Such light physical exertion under normal conditions would scarcely be appreciated in its effect on the physical organization of a healthy laboring man. In this case were are forced to consider the degraded air and the heat as the cause. We can practically eliminate the degraded air of the bunkers by considering the amount of work done under similar conditions but in a temperature below that of the body. We are forced to admit that it is principally due to excessive heat.

Extract from report on the U. S. S. *Bennington*, 1898, by Passed Asst. Surg. E. P. Stone:

The men of the engineer's force, all of whom swing in the wing passages and after berth deck after four hours of severe and arduous toil in the frightful temperature of from 140° to 150°, would come off watch and endeavor unsuccessfully to get rest and sleep in the only comparatively less trying temperature of from 90° to 100°. Unable to sleep, worn out with fatigue, and annoyed by prickly heat, it would be jaded and discouraged men who would respond to the next call to go below on watch. Is it to be wondered at that the medical officer is called upon to furnish stimulants to keep these men up to their duty? Is it to be expected that men in such a condition can do efficient work? And may not a fireroom force in such a plight seriously cripple the fighting efficiency of a ship, as my predecessor has pointed out in his report? It has been the custom on this ship to give, when under way, each watch in the fire and engine rooms some liquor, either during or at the end of the watch. On our way here from San Diego I conformed to the custom after the first few days, principally for its mental effect on the men, as they expected it, and furnishing the liquor served to keep them contented. I have not had enough practical experience yet to feel like making a positive statement, but so far as my experience goes it has inclined me to be opposed to the issue of spirits to men subjected to high temperatures. It produces a temporary stimulation, but leaves the men ultimately in a state of lessened resistance. I believe a better stimulant, and a useful prophylactic, is the administration of strychnia. In those cases of heat prostration that give rise to muscular cramps I believe, theoretically, that subcutaneous injections of normal salt solution ought to give relief.

Extract from report on the U. S. S. *Massachusetts*, 1899, by Surg. S. H. Dickson:

I had been led to expect, under the circumstances of war and during a close blockade and operations in the Tropics of such duration in the summer months, that many cases of heat prostration among the 100 men of the engineer force would be encountered. With fires lit all the time and steam all over the ship; bottled up, so to speak, every night, with temperatures in the firerooms frequently and for hours at a time from 144° to 150° F., in the engine-room rarely below 120° F., conditions were constantly favorable for their development; and yet but 14 cases in all were admitted to the sick list, and these occurred after the removal of the strain and excitement of actual hostilities, and none of them was of a serious character. Careful hygienic measures,

such as frequent opportunities for bathing and washing, and the intelligent and constant use of the ventilating blowers, supplying an abundance of fresh air, undoubtedly led to this result. On only one occasion, and for a brief period during the voyage from Porto Rico to Cuba, was it considered necessary to issue a small spirit ration to the engineer division. It put heart into the men and was productive of nothing but good. It was given to each watch on coming off duty and after they had washed and cooled off.

Extract from report on the U. S. S. *Columbia*, 1899, by Surg. C. G. Herndon:

A number of men at various times were more or less overcome by heat in the dynamo, engine, and fire rooms, and were promptly brought to the sick quarters. The heart, and not the brain, was the organ which had given out among these men. The routine practice was to stretch the man out on the cofferdam, with the head low, loosen all tight clothing, and give him a liberal dose of whisky or brandy with digitalis. Usually, in a short time he would go off into a quiet sleep, and wake up ready for work.

I am opposed to the routine issue of alcohol to the men below while on watch, but from my experience, and more particularly on this ship, I believe it would be well, if the bureau sees fit to do so, to increase the amount of whisky in the medical supplies and allow the medical officers to give it to deserving men coming off watch when they show markedly the effects of the long exposure to the high temperature in which they work.

I have seen various stimulants used, but nothing, in my experience and belief, does these men as much good when coming off watch as a ration of whisky diluted with water, and, if necessary, with some digitalis added.

Surg. M. H. Simons, on the U. S. S. *Iowa*, in 1899, reported:

During the trip to San Juan, and on one or two other occasions when the heat was great, the men in the engine and fire rooms drank so much warm water that nausea and vomiting often occurred, and nothing could be retained. We found that under these circumstances the trouble could be checked and even avoided by a moderate dose of alcoholic stimulant (part of the time we used alcohol itself), with capsicum, gentian, or hydrastis. This dose seemed to put the stomach in proper tone for the digestion of food and to lessen the thirst. As a preventive it was given when the men came off watch. Heat prostration was treated by putting the man in a bunk with a wet towel over his face and head and given 0.6 gram of acetanilid; in one hour, if the temperature still stood above 100°, 0.3 gram was given until the temperature stood below 100°, and then a bath was given, in which the patient lay for 15 minutes; the water was at first warm and then gradually cooled to the temperature of the sea water in the pipes, probably about 76°. The acetanilid equalized the circulation and subdued the nervous symptoms: the lukewarm bath seemed to aid this and to exert a specially and noticeably good effect on the digestive tract.

In discussing "The alcohol question in the Navy," Medical Director P. A. Lovering, who was surgeon of the U. S. S. *Oregon* during the Spanish-American War, stated:

I remember that on the cruise of the *Oregon* around from San Francisco, Capt. Clark every day, at his own expense, furnished the firemen coming off the afternoon watch with a drink of spirits. It encouraged the men, did good, and I was very glad that I could recommend it as a beneficial measure.

From our more recent knowledge of the precise nature of the action of alcohol in small doses, it seems evident that the benefits noted in the foregoing reports were psychical, and doubtless attributable to the narcotic effect; alcohol, in these cases, probably induced a more comfortable frame of mind, indicating consideration upon the part of officers in authority, and withal favored relaxation, akin to that sometimes given after disease or injury to relieve undue apprehension. It is significant that no naval reports of the last decade refer to the use of alcohol, either in prophylaxis or treatment.

With reference to the well-known advantage of having ships painted with light-reflecting surface, Medical Inspector T. C. Walton, reporting on the U. S. S. *Chicago* in 1899, says:

Changing the color of the outside of the ship from black to white is believed to have lowered the temperature on this [gun] deck, during the summer days when the sun shone on the ship's sides, from 4° to 6° F. During the speed trials of this ship at Newport, in Sepetmber last, the temperature in those parts of the engine rooms was recorded as high as 129°. The air at the time was laden with moisture from escaping steam. A prolonged stay there was described as being unbearable. The engineers on duty were quickly prostrated. Efficient ventilation was urged.

Inadequate ventilation and removal of heated air on the earlier all-steam propelled ships is attested by the following quotations:

Medical Inspector G. W. Woods reported, on the U. S. S. *Charleston*, in 1890:

The heat of the dynamo room is often so great that the thermometers indexed for 140° can not register the temperature, and the men perform their work entirely naked, complaining of nausea and vertigo whenever the revolutions of the little electric blower are even for a brief period suspended.

Surg. T. H. Streets reported on the U. S. S. *Bennington*, in 1893:

The temperature of the fireroom previous to these changes [new hatch opened and new ventilators] was frequently as high as from 140° to 150°. The temperature has been materially reduced. The highest it has reached since the opening of the hatch is 112°.

On the U. S. S. *New York*, on January 11, 1894, Medical Inspector Edward Kershner found the temperature of living and working spaces to range from 88° to 108° F., throughout the ship, when the outside air registered 82°, although the trade winds blew at the rate of 6 knots on port bow, the ship making 13 knots under but four boilers, and burning but 85 tons of coal per day.

Likewise, in 1894, Surg. W. G. Farwell reported on the U. S. S. *Columbia:*

The temperature of the engine and fire rooms is excessive when firing hard; the temperature of the fireroom ranges from 140° to 150° F., and that of the engine room from 105° to 110° F.; when firing immediately the temperature

is respectively from 120° to 125° F. and from 98° to 100° F. The temperature of the cabins opposite [the engine-room hatches] was 90° F., an almost unbearable degree of heat for a sleeping room.

The recording of excessively high temperatures was the rule, rather than the exception, for a few years prior to, and immediately following, the Spanish-American War of 1898.

Surg. C. A. Siegfried reported, on the U. S. S. *Cincinnati*, in 1894:

In the dynamo rooms, by means of electric (additional) blowers, the temperatures have been reduced 20° F., and they now rarely rise above 110° F. The ventilation of the engine room is very unsatisfactory, and temperatures are recorded from 90° to 170° F. I have myself recorded fireroom temperatures as high as 168° F. In the engine room, lower platform, the average is about 102° F.; on the upper platform it frequently reaches 135° F.

Surg. E. Z. Derr, on the U. S. S. *Raleigh*, in 1894 and 1895, reported:

The inadequacy of fireroom ventilation made itself manifest on the first trial trip to Hampton Roads: Steaming half power, the temperature of the starboard forward fireroom in the boiler interspace, 5 feet above the floor, reached 180° F. Three men were exhausted by the heat. On September 10, steaming under the same easy conditions, it reached the same, and two men were exhausted. On September 11, 190° F. was recorded. On the fireroom galleries, where the blowers were located, the thermometer registered 205° F., rendering it impossible for the men to superintend them, and accordingly they were not used. The firerooms were therefore dependent upon natural ventilation alone, and that supplied by the ventilation was wholly inadequate to keep down the temperature.

Medical Inspector J. G. Ayres, on the U. S. S. *Olympia*, in 1895, reported temperatures of 180° F. and above in two of the firerooms which had no blowers.

Surg. C. A. Siegfried again, in 1895, on the U. S. S. *Texas*, said:

It is to me doubtful if any possible system of ventilation in some of these spaces would correct the high temperature ranging from 125° F., in dynamo rooms and redoubt, to 170° F. in hydraulic pump rooms. When the ship is underway the heat becomes excessive, and during the short periods of time when making steam trials last September the number of cases of heat exhaustion treated in one day aggregated 12. The hydraulic rooms furnished most victims; hence the more thorough covering of the hot metals and pipes with nonconducting materials becomes imperative.

The improvement made on the U. S. S. *Cincinnati* in 1895 is shown by the report of Surg. L. B. Baldwin, in which he showed average temperatures of fireroom No. 1 to be 143°, 188°, 187°, 184°, 189°, 191°, and 109° F., with a maximum of 204° F. between June 30 and May 12. After some changes in management of blowers, the average temperature was reduced to 126° and 139° F., with a maximum of 170° F. The average for the year in this fireroom was 145.8° F.

The Surgeon General's report of 1897, covering the year 1896, stated:

Of the 59 cases of heat stroke, 40 were caused by heat in fire and engine rooms, 7 of the latter being returned from the *Raleigh*, 5 from the *Indiana*, 4 each from the *Amphitrite* and *Massachusetts*, 3 from the *Maine*, *Newark*, and *San Francisco*, and 2 each from the *Cincinnati*, *Alert*, and *Marion*, the remainder, 5, occurring scattered, 1 on each ship.

Surg. Robert Whiting, on the U. S. S. *Monterey* in 1895, reported:

The continued strain of resisting the high degree of heat early began to tell upon the men of the engineer's force. The closed fireroom of the *Monterey* has no outlet overhead, the doors opening on one side into the overheated engine room and on the other into the berth deck. The forced draft ventilation not being in use, it was discovered that the fireroom was fed by hot air from the engines on one side, and, on the other, by air that had been devitalized by use on the berth deck. The medical officer, upon one of his inspections, found the temperature as high as 147° F. There were quite a number of cases of exhaustion and vomiting, most of which were treated without entry upon the sick list.

The drills at general quarters, which were more frequently performed than any others, required the use of steam in the pump rooms underneath the wardroom officers' quarters and under the berth deck. It will be observed, by reference to the temperature charts, that these pump rooms registered the highest degree of heat, 180° F. It required hours to bring the atmosphere in the wardroom down to 90° F, after these drills were concluded. The dynamo room contiguous to the forward turret, and underneath which the forward pump room is located—the main compartment of the berth deck separated from it by a steel bulkhead—suffered in similar fashion.

Surg. James E. Gardiner's report, on the U. S. S. *Amphitrite*, in 1896, stated:

So far, the most serious trouble developed has been the one of the high temperature generated on the modern iron and steel ship filled with engines and imperfect means of ventilation so far devised to relieve the evil. From the records of the medical journal the suffering from this cause, while the ship was cruising during the months of July and August, was great. Temperatures as high as 183° F., in the fireroom, are recorded, with 167° F. given as the minimum during the 24 hours of that day. In the engine room, for the same day, are recorded 155° F. as maximum and 148° F. as minimum; the berth deck, 102° F., maximum; a stateroom in wardroom, 98° F. There were numerous cases of heat prostration, cases of myalgia, cramps, and sudden diarrheas. A board appointed by the commanding officer, after carefully collecting the data, made its report, and the ship was ordered to the navy yard at Norfolk, where the changes were made. Since then the conditions have greatly improved. No test as severe, though, as that of last summer's cruising has been made since the change, but it is believed that no such temperatures will again be reached.

Extensive temperature observations, made by Medical Inspector J. G. Ayres, in the dynamo room of the U. S. S. *Olympia* in 1896, gave the maximum as 121° F. and mean as 113° F. for August; and 113° F. and 105° F. for October. In the same year the dynamo room of the U. S. S. *Columbia* was found to have a temperature range

from 110° F. to 125° F., and the steam steering room exceeded 120° F., with defective ventilation.

The means for adequately heating certain living spaces in ships often proved intolerable to other compartments, as is shown by Surg. W. S. Dixon's comment on his own stateroom, on the U. S. S. *Brooklyn*, in 1897:

No less than 75 feet of steam pipe (heating) is very close to the berth—some of it within 2 inches and none of it more distant than 40 inches. Five pipes pass through the room and four are separated from it only by a thin metal bulkhead. Until the five pipes (45 feet) had been additionally covered with felt, one could not sleep in the bunk. With an outside temperature of 19° F., that of this room was 90° F., as determined by reliable thermometers, and the air duct was delivering cold air in the room at the time. In one of the double-berth rooms of the junior officers two thinly covered steam pipes pass along the whole length of the upper berth and in such close proximity that a man of ordinary proportions could scarcely crowd in between the mattress and pipes. It would be impossible for anyone to sleep there while steam was being used to heat the ship.

Surg. W. R. Du Bose reported, from the U. S. S. *Terror*, in 1897:

Practically, the ship has done no cruising, and exactly what temperatures will be experienced remains to be seen. In the short trips made the engine-room temperature has been 118° F.; the fireroom 116° to 142° F., generally 122° F.; the forward turret machinery space 124° F. In the superstructure, during a heated term in July and August, a temperature of 110° F. was several times noted. No case of heat exhaustion has occurred.

Surg. P. A. Lovering, on the U. S. S. *Oregon*, in 1897, reported:

The berth deck is also very warm, as it is over the main boilers, and in it is placed the auxiliary fireroom. When the vessel is underway the temperature often rises to 100° F., and even higher, and rarely falls below 85° F. The forward compartment of the citadel is fairly lighted by 12 deck lights, but has no direct air supply. It is much cooler than the central compartments, as it is forward of the boilers.

Each engine room has, besides the usual hatch, a blower for artificial ventilation. The temperature ranges between 90° F. and 100° F. when underway.

Each of the eight firerooms has a large ventilator, and also a blower for forced draft, which is used for ventilation. When underway the temperature has reached 135° F., but is usually 5° to 10° F. lower. This temperature was in cool weather, when the outside air was 60° F. or less, and it is quite probable that in warmer weather the firerooms will be much hotter.

There have been no cases of heat prostration.

The protests of some of our medical officers during this period were almost pathetic, as is seen in the following extract from the report, on the U. S. S. *Bennington*, in 1898, by Surg. John W. Baker:

We should build our ventilators larger and higher and make them more numerous; provide our firerooms, bunkers, and engine rooms with fans on a large scale, until we no longer are content that men should, in these days of modern science, toil and labor in a vitiated atmosphere at a temperature varying from 130° to 170° F., until they are temporarily exhausted or permanently disabled, and that, too, long before the period assigned to men who live on deck in fresh air and wholesome sunshine, and who are never called

upon to make the physical exertion, save in unusual emergencies, that these men must make every day, if we would maintain our speed at sea, speed and turning in evolutions, in fact the efficiency that is not only desirable but absolutely essential for our success in warfare and for which our ships are constructed.

Surg. M. H. Simons, reporting on the U. S. S. *Iowa*, in 1899, stated:

The ventilation of the distiller room is entirely inadequate, and the temperature is so high (145° F.) frequently that the man neglects his watch on the gauge to stand under the small cool-air inlet. The exit shafts for hot air in the dynamo room are so small that half the hot air collects in one or the other ammunition passages, increasing greatly the discomforts of those who must work there, especially in battle. The temperature of the dynamo room varies from 107° to 125° F.

The staterooms for the officers in the citadel, at sea in warm weather, have a temperature range of from 93° to 100° F. Artificial light has to be used all the time.

Surg. John M. Steele, on the U. S. S. *Monadnock*, in 1899, reported:

On entering the tropical zone, where the temperature of the air and water are nearly the same and high, about 84° F., the vessel heated up rapidly and remained so.

The hottest part of the vessel in which men live is the superstructure and warrant officers' quarters. The warrant officers' quarters are next to the dynamo room, and separated by an iron bulkhead, and in the forward room the temperature averages about 95° F. In the superstructure is situated the cabin and wardroom, officers' quarters, also the galley, the officers' water closets, and the mens' head. These apartments are directly over the fire and engine rooms, and the heat here is high and continuous night and day, with an average of about 94° F. There is a slight remission in the early morning hours. In addition to hatches, deck lights, and air ports, the present means of ventilation should apply to the superstructure, and an active method of introducing fresh air, which could be accomplished by two additional blowers, to force air into the entire vessel. This addition would combine the plenum and exhaust which I believe is necessary for the best effect for the health of the crew.

From a better ventilated gunboat, the *Annapolis*, in 1898, Asst. Surg. S. B. Palmer reported:

No excessively high temperatures have been noted in the engine and fire-rooms. The two cases of heat exhaustion, of mild grade, which were treated, were men unaccustomed to this work.

Asbestos sheathing helped to alleviate suffering in the living quarters abaft the engine-room trunk of the U. S. S. *New York*, in October, 1899, where the temperature had formerly ranged from 98° to 110° F. Medical Inspector C. U. Gravatt urgently advocated similar insulation in the dynamo room and evaporating room.

All evaporators are nowadays well covered with asbestos, conserving heat for their more economical operation and promoting comfort for their tending.

The surgeon of the "flying squadron," Medical Inspector Paul Fitzsimons, for 1898, stated:

The fleet blockaded Santiago for five weeks, lying off the entrance about 2 miles in the open sea. Fortunately, the trade winds were usually fresh, and no one suffered from the heat on the main and gun decks. The berth deck was like an oven. It was heated on the outside by the sun and inside by three smokestacks, the battle ports were closed, and a moderate amount of air was driven by the blowers. The warrant officers' rooms were uninhabitable. The awnings could not be spread, and, after a time, the men were permitted to sleep in the open instead of sweltering below. They would lie on the forecastle wrapped in blankets, and no case of sickness was caused by it. The crew also worked in the sun coaling ship frequently without injury.

Since the Spanish-American War, conditions have steadily improved, and the unfavorable reports have come chiefly from the older armored ships, notably the *Monadnock*, *Massachusetts* (in the firerooms of which Surg. J. C. Byrnes reported, in 1900, an occasional temperature of 210° F., reduced 30° F. by changing location of blowers), *Monterey*, *Chicago*, *Iowa*, *Brooklyn*, *Illinois*, *Wisconsin*, *Albany*, *Oregon*, *Alabama*, *Newark*, *Kentucky*, *Colorado*, *Ohio*, and *West Virginia*. Many reports at hand from these 16 vessels, while very interesting, merely reiterate the high temperatures of the living and working quarters.

On the U. S. S. *Texas*, Surg. H. E. Ames reported steering engine-room temperatures of 110° to 115° F., and humidity "so great that there is no evaporation from the body, and those of the crew who are stationed there at sea are exhausted at the end of two hours." The firemen's wash rooms were "from 130° to 145° F." and, of course, the air was saturated with moisture. Fireroom temperature under natural draft was 150° F.

From the U. S. S. *Wisconsin*, in 1906, Medical Inspector H. G. Beyer reported as follows:

Battleships and monitors will always be the most uncomfortable ships in a climate such as this (Cavite). With perfect sanitary conditions the constant high temperature and humidity from within and without are bound to cause a steady lowering of the average physical and mental strength and endurance of every human being on board. This generally acknowledged fact makes frequent change of station, especially for battleships, not only desirable but imperative.

During the passage of this vessel from Hongkong to Cavite between December 28 and 30, 1905, a series of heat prostrations occurred. Of the 14 cases, 10 were firemen, 2 water tenders, and 2 coal passers. The symptoms varied but slightly in the different cases, and were chiefly those of collapse, with dizziness, headache, and severe cramps in the legs, thighs, arms, forearms, back, and abdomen. In no case was there embarrassment of speech, although loss of voice was noted in one fireman, who stated that this was his second attack. Two of the cases did not show distinct symptoms of heat prostration until some little time after leaving the fireroom, and one of the two was found unconscious.

These patients were at first rubbed with towels soaked in hot water, with excellent results. Some in whom the cramps were painful and distressing

were rubbed with chloroform liniment. Rest, of course, was enjoined upon them, and all were off the list and on duty two days after the arrival of the ship in port.

The direct cause of the outbreak was the heat in the fireroom from what is known as assisted draft. In assisted draft, the fireroom is made as tight as possible, the air inlets and the furnace outlets being the only places in open communication with the fireroom. But, unlike what happens during forced draft, when the blowers have their speed increased, and the incoming volume of air is very much greater than under ordinary draft, in assisted draft the incoming current remains the same, or may even be reduced.

Several points in connection with the occurrence of this interesting series of heat prostrations seem to be unusual. The temperature in the fireroom was not excessive, and alone could scarcely account for so widespread an effect; the relative humidity of the atmosphere was very high, and the temperature and moisture of the atmosphere suddenly increased the day the prostrations occurred. The afternoon we left Hongkong, officers and men wore blue with comfort; the next morning white was ordered, because of the sudden climatic change.

Complaints of high temperatures and humidity on the smaller cruisers and gunboats were made in reports from the *Petrel* (160°), *Isla de Luzon* (172°), *Albany* (136°), and *Princeton* (115°).

On the newly commissioned U. S. S. *Maine*, in 1903, Surg. N. H. Drake recorded 45 cases of heat prostration:

Fifteen admissions to the sick list were allowed for this condition, and about 30 others were treated for vertigo and cramps in the muscles of abdomen and limbs. Only one of those admitted remained on the sick list more than two days, he being under treatment for five days. Many of those not admitted were excused for the whole or a portion of their watch below. This unusual number of cases was attributed to a combination of circumstances, viz: New men unfit for service in their ratings; varying temperatures caused by drafts and blowers; improper clothing of the men in the fireroom; the use of too much cold water while on watch; drinking water unfit for use on account of chlorides, and extremely hard work in a climate to which many of them were unaccustomed.

Asst. Surg. A. G. Grunwell, who later evolved the interesting theory that heat cramps might be occasioned by absorption of toxins of tetanus bacilli from intestinal contents, in 1900 treated heat stroke successfully by venesection in the walled city of Tientsin during the Boxer uprising.

The following extracts from the annual report of 1909 of the Surgeon General of the Navy, show how recently heat affections seemed to deserve special attention:

Heat exhaustion is less prevalent than it was two and three years ago for the reason that the small cruisers with poorly ventilated firerooms have either been withdrawn from tropical service or placed out of commission. The opinion that heavy muscular work has been a contributory essential, and that heat, humidity, and rapid cooling of the body are not the only causes, receives some support from an observation of Passed Asst. Surg. G. H. Hathaway, on the U. S. S. *Cheyenne*, which now burns oil fuel; this officer shows that during the standardization runs at maximum speed, the temperature in the fireroom rose

to 140°, which is about 10° higher than under previous similar conditions when burning coal. Nevertheless, in this higher temperature no case of heat prostration occurred, nor during the cruise has any member of the engineer's force succumbed to the heat. It is thought that the slight amount of physical exertion required to regulate the burners, as compared to passing coal, enables the fireroom watch to withstand a greater elevation of temperature. While cruising, the number of men on duty in the fireroom is reduced to about one-half those required for coal fuel, which is of some sanitary advantage. * * * Just what factors enter into the causation of the condition known as heat prostration observed in those exposed to excessive heat, either solar or artificial, particularly fireroom, is not definitely known to-day. There have been a great many cases in the Navy during past years, and though, in 1908, a fewer number than usual were reported, and although effort has been made, and is being made, to improve the condition under which the engineer's force performs its duties, there seems no immediate prospect that the condition will cease to be an important type of disability.

Although not occurring on shipboard, it would be amiss not to include in these extensive quotations the cases mentioned in an extract from the report of Surg. G. A. Lung, on duty with the First Regiment of Marines, in the Peking Relief Expedition of 1900:

Two types of heat stroke were observed. The more common one was exhibited with extreme fatigue, mental depression, weak circulation, with perhaps partial loss of consciousness. The other appeared more suddenly and was marked by hard, fast pulse, suffused face, bloodshot eyes, complete unconsciousness, and perhaps delirium, with muscular spasms of the entire body. These cases would appear while the column was moving, or immediately on coming to a rest. If on the march, they would stumble and fall in the roadway, or, while sitting, would suddenly topple over. The first intimation the medical officer would have would be the cry with stentorian insistence for the doctor, and on some days it came with startling frequency. They were carried to one side, an imperfect shelter from the sun for the head made by bending several standing cornstalks together, and the best remedies at hand applied. If the patient appeared seriously ill, a man was left with him, or several thus affected would be gathered together and one man look after all. In the meantime the column would move on, leaving them behind. The number who had convulsions was comparatively small. A large percentage became unconscious.

August 10th was a peculiarly trying day because of the heat. By noon, fully 75 of the regiment had dropped out. It is true some of these were only very badly wearied, and found an example in those who were more than wearied. There was, however, no shirking or malingering. Every man seemed to realize the character of the expedition and the purpose for which it was made. Indeed it was sometimes touching to see a man with a determined expression, trudging along, staggering from weakness and the weight of his accouterments, and with a degree of illness that entitled him to a bed in a hospital. A few of the men, instead of dropping out at once, would gradually drop to the rear where they would totter along, crying like a lost child, until relieved of their burden by a companion, or forced to lie down and rest.

A most remarkable feature of these cases of heat stroke was the rapidity with which they recovered. Often, without any treatment whatever, and by night, all, by helping one another or by getting a lift in a wagon or a ride on a horse, would overtake the column encamped for the night. The following day they would take their places in the ranks again. If the expedition happened to

be near the river, and junks were available, the worst cases were sent on them for a day's rest.

There were but two deaths from this cause, one occurring at the battle of Yangtsung and the other at Tungchow. Two were afflicted with mild melancholia, but after a short rest in the hospital they recovered.

Undoubtedly the most complete reports on heat cramps by medical officers of the Navy in recent years are those of Surg. M. S. Elliott in the Military Surgeon for March, 1908, and of Surg. A. G. Grunwell in the United States Naval Medical Bulletin for July, 1909. Their clinical notes are too extensive to be quoted here, and from the one autopsy by Elliott the only characteristic pathological condition found was congestion of kidneys.

Sunstroke, as typically occurring in the midsummer heat of our cities, is now comparatively rare in the Navy, the last published case being one observed by me off Acajutla, Salvador, in 1907, in the person of a boat keeper of the U. S. S. *Marblehead*, who fell asleep and became unconscious in his boat without awning cover and experienced total amnesia for 69 hours. Thermic fever does not appear to have been a very important factor since the Spanish-American War, when 89 cases were recorded. During the 25 years from 1886 to 1910, inclusive, there were returned 1,507 heat cases, of which 64 per cent were heat prostration (commonly of the exhaustion type), 32 per cent were classified as thermic fever, and 4 per cent as insolation. About one-third of the cases of thermic fever developed on shore, and doubtless a good part of the few on board ship were ill-defined confusion cases.

So far as I can learn, heat stroke between decks among men not performing hard work is unknown in our Navy. If it were now common for persons to be stricken in cabins while asleep, we should certainly look for the condition among our 10,000 man-o-war'smen here about Key West and Cuba during this midsummer.

From the recorded and personally received opinions of naval medical officers I feel justified in affirming that the characteristic heat affection of the naval personnel has during the past quarter century been "prostratio thermica" heat exhaustion, largely confined to the fireroom force. During 1909 and 1910, respectively, the admission rates per thousand for heat affection in the fireroom force were 8.45 and 7.91, respectively, while for the entire service they were 2.79 and 2.16, respectively, every other occupational group having ratios below the mean with the exception of the engineer's force, which were 3.26 and 2.78 for the respective years. This most common form, heat exhaustion, is believed to be a disease entity with either the systemic or muscular symptoms predominating, the one form sometimes predominating almost to the exclusion of the other. The heat regulation centers do not appear to be so profoundly incapacitated as in sunstroke, there being but slight fever or very commonly the sub-

normal temperature of shock. Marine Oberassistenzarzt, Dr. Esch, however, considers his case chiefly one of deranged nerve centers.

There is pallor or lividity, drenching perspiration, weakness of both voluntary and involuntary muscle, the circulatory and respiratory functions being profoundly embarrassed. Sensory motor phenomena are those of exhaustion rather than of the irritable, responsive to the least stimulation, type; there is the tendency to sleep and stupor rather than to convulsions. Now, although paradoxical, it is no inconsistency that the other notable symptoms may become prominent, such as fibrillary twitchings and violent painful cramps of muscles of abdomen, arms, and legs. These can hardly be due to any systemic nerve poison, but must be consequent upon a local dehydration of muscle tissue with a diminished alkalinity of plasma from excessive production and retention of katabolic acids (sarcolactic, carbonic, and lactic) which have been shown by McDougall and E. B. Meigs to attend muscle rigor. The accumulation of products of tissue metabolism generally may account for vaso-motor paresis and shock. It is, of course, important to distinguish cases of intestinal cramps due to dietetic error or ice water ingestion from the heat cramps of abdominal wall muscles.

The etiology and incipiency of heat exhaustion need not be at variance with those of sunstroke except in intensity; the assumption is tenable that in sunstroke the factors are so fulminating and of such an overwhelming character that heat production and loss are promptly deranged, whereas the symptoms of heat exhaustion represent the sustaining and finally failing efforts upon the part of the human body to overcome its adverse environment. I shall be content to enumerate these factors in causation of heat exhaustion, no one of which has been certainly eliminated as either contributory or immediate; no special combination seems to be essentially determining: Chronic alcoholism with fatty infiltration of the heart,—dilation, when called upon to pump more blood through lungs and skin under stimulation of excessive heat; dissipation or debility from disease or unsuitable hygiene, such as overcrowding; hard muscular work (Edsall), and unrelieved fatigue; insufficient circulation of air and wet-bulb temperature from 85° to 95° (J. S. Haldane's critical point, and Harvey Sutton's vicious circle); lack of habituation; constricting or heavy clothing; fright or panic induced by occurrence of other cases, as shown by Oswald Rees, R. N.; loss of sleep (H. M. Welch); improper nutritive ratio; excess of protein and deficiency of carbohydrates; insufficient assimilation of water; to these may be added Senftlenben's observation of blood concentration, red corpuscle destruction, and hæmoglobinemia more commonly expected in sunstroke: arterial anemia, toxin and fibrin ferment accumulation from preponderance of skin over kidney excretion, and leucocyte

destruction (Maurice de Fleury); predisposition by former attacks (W. H. Cameron and Logan Clendening). The actinic theory of Lieut. Col. R. J. S. Simpson is mentioned merely to be excluded from our cases among the fireroom force.

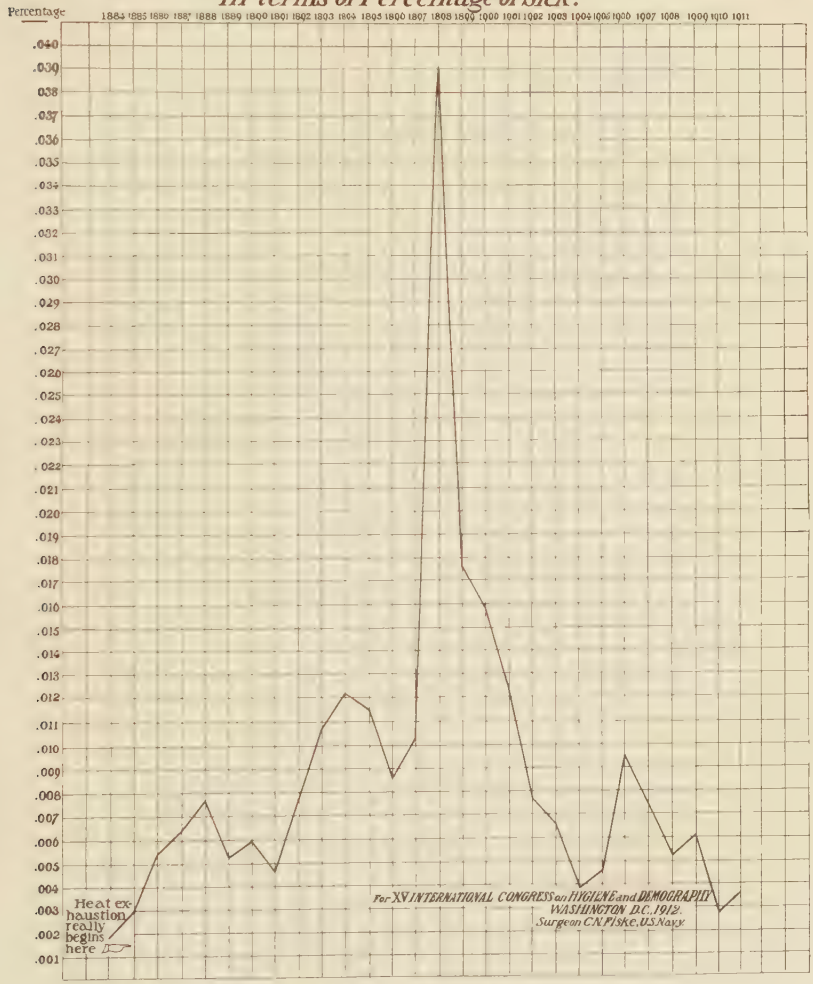
For the physiologist, no doubt, the inclusion of so many causative factors, direct or remote, is very unsatisfactory, confusing, and a confession of ignorance, but, for the hygienist, their probable relation has given such hints that the removal of few or many has contributed to the great decline in heat exhaustion and cramps in the Navy. If I were called upon to single out any one remdy to bring about this result more than another, it would be the increased circulation of air where the men work, rather than any mere lowering of temperature or humidity.

Statistical table of heat affections in the United States Navy and Marine Corps, 1861–1911.

Year.	Mean strength (medical returns).	Cases.	To hospital.	Invalided from service.	Deaths.	Sick days.	Total damage in percentage of sick.
1861	20,000	5					
1862	25,905	34					
1863	40,000	16					
1864	43,787	27					
1865	32,641	3			1		
1866	17,193	(1)	(1)	(1)	(1)	(2)	(2)
1872	11,570						
1873	12,723	14					
1874	13,870	19					
1875	10,141	5			1		
1876	11,138	8					
1877	7,461	[3] 17					
1878	7,806	10				26	0.000791
1879	8,869	(4)					
1880	9,003	23		5		89	.026668
1881	9,546	18	3	1		50	.005729
1882	9,371	12	1			61	.001576
1883	9,197	10	1	1		166	.009670
1884	9,959	18				72	.001797
1885	9,191	[5] 20	1			103	.003070
1886	9,188	5			1	20	.005442
1887	9,618	41	1			226	.009438
1888	9,955	25			1	96	.007657
1889	11,219	33	3			216	.005275
1890	11,768	37				257	.005983
1891	11,301	41	3			195	.004645
1892	11,775	29	2		1	135	.007760
1893	12,109	51	1	1		293	.010758
1894	12,520	44			2	190	.012145
1895	12,671	92			1	359	.011562
1896	13,768	59	3		1	257	.008622
1897	15,229	81	4		1	339	.010356
1898	23,038	512	19	7		2,054	.039019
1899	20,113	154	10	1	1	939	.017594
1900	22,977	128	13		5	442	.015798
1901	26,101	95	4	2	1	645	.012352
1902	30,249	95	5	1	1	503	.007757
1903	36,535	94	2	1	2	333	.006543
1904	39,450	92	13			569	.003941
1905	39,620	160	3			655	.004529
1906	41,690	168	15	3	1	739	.009559
1907	44,083	86	4	4		504	.007448
1908	50,984	106	17	1		801	.005220
1909	55,550	155	6	3		703	.006090
1910	56,721	125		1		391	.002755
1911	61,399	88		1	1	423	.003516

[1] No data available in published reports from 1866 to 1872.
[2] Apparently all insolation.
[3] "Heat exhaustion" (2 cases) first mentioned on Asiatic Station.
[4] Not mentioned in reports.
[5] "Heat exhaustion" really begins.

Curve of Total Damage from Heat Affections in U.S. Navy and Marine Corps in terms of Percentage of Sick.



ÜBER DIE UNGLÜCKSFÄLLE UND BERUFSKRANKHEITEN DER MINEN- UND TUNNELARBEITER.

San.-Rat Dr. WILHELM LINDEMANN, Oberarzt des Allgemeinen Knappschafts-Vereins in Bochum, Deutschland.

LEITSÄTZE.

1. Durch die Fortschritte der bergbaulichen Technik haben die tötlichen Verletzungen eine Abnahme erfahren.

Die Verletzungen überhaupt zeigen eine Zunahme, die jedoch geringer ist, als die Zahlen der Statistik angeben, und die an erster Stelle bedingt wird durch eine schnelle Entwickelung des Bergbaues und die dadurch bedingte Einstellung ungeschulter Arter.

Die Unfallgefahr im Bergbau erfordert auf jedem Bergwerk Vorkehrungen für die erste Hülfeleistung und Bildung von Rettungscentralen und Rettungswehren.

2. Das Emphysem verdankt an erster Stelle der anstrengenden Arbeit im Bergbau seine Entstehung. Fortschritte der bergbaulichen Technik vermindern diese Krankheit.

3. Die Anthrakosis pulmonum ist eine Inhalationskrankheit. Schwere Erkrankungsfälle werden verhütet durch Anwendung des Berieselungsverfahrens im Bergbau, durch Vermeidung der Kinderarbeit und durch wohlwollende Invalidisierung der Arbeiter.

4. Der Kohlenstaub verhindert weder die Entwickelung der Tuberkulose noch des Carcinoms; er begünstigt nicht die Entstehung akuter Lungenerkrankungen.

5. Die Zahl der rheumatischen Erkrankungen wird weit überschätzt.

6. Der Nystagmus der Bergleute ist eine Folge von Überanstrengung und Blendung der Augen bei der bergmännischen Arbeit; er verhindert nicht, an der Benzin-Sicherheitslampe die zuverlässige Wahrnehmung eines Schlagwettergehaltes der Grubenluft von 2–3 Prozent.

7. Eine spezifische Blutarmut der Bergleute besteht nicht.

8. Zur Verhütung der Anchylostomiasis bleibt die Beschaffung transportabler Abortkübel die wichtigste hygienische Massnahme. Die mikroskopische Kotuntersuchung wird in ihrer Zuverlässigkeit überschätzt.

M. H. Wenn ich der Aufforderung unseres Herrn Präsidenten, Ihnen heute ein kurzes Referat über die Unglücksfälle und Berufskrankheiten der Minen- und Tunnelarbeiter zu erstatten, gerne entspreche, so bin ich mir wohl bewusst, dass die erdrückende Fülle des Stoffes einen Verzicht auf Vollständigkeit gebietet, und dass die weitgehenden Verschiedenheiten der örtlichen Verhältnisse ein zusammenfassendes Urteil erschweren, gleichwohl gebe ich mich der Hoffnung hin, dass meine Ausführungen, die sich stützen auf die Erfahrungen des Allgemeinen Knappschafts-Vereins Bochum, des grössen deutschen Knappschafts-Vereins, der die 350,000 Bergleute des Rhein.-Westf. Kohlenbergbaues umfasst, in dem einen oder dem anderen Punkte nicht ohne Interesse sein mögen. Auch bei dieser Beschränkung gestattet die mir zugemessene kurze Zeit nur einige wichtige Punkte heraus zu greifen, und ich muss um Ihre Nachsicht bitten wenn ich um wenige Minuten die mir zugemessene Zeit überschreiten sollte.

Die dem Bergbau eigentümlichen Grubenkatastrophen durch Schlagwetter und Brandwetter sind es vor allem, die das allgemeine Interesse wachrufen. Auch in den letzten Jahren haben derartige Katastrophen den Bergbau vielfach heimgesucht. Ich nenne nur die Namen Courrières und Radbod. Ich verweise ferner—um nur die grössten Unglücksfälle hervorzuheben—auf die Katastrophe in der Steinkohlengrube der Lackawanna Coal and Coke Co. Wehrunin (Pensilvanien), auf den Grubenbrand der Zeche Borussia in Westfalen, ich erinnere an das Schicksal der St. Paul-Grube in Cherry in Illinois, an die Katastrophen in Primero (Colorado) und Drakesburg in Kentucky, an die Katastrophe der Palosmine in Alabama, an die Massenunglücke in den Minen von Whitehaven und Knoxville, an den Grubenbrand der Schwefelgrube Caltanisetta in Sizilien und an die schweren Explosionen in MacKurtin (Oklahoma), in Bluefields (West Virginia). In aller Gedächtnis sind noch die Katastrophen auf der Insel Yesso in der Grube der Hokkaido-Gesellschaft und in Cadeby in England, das schwere Grubenunglück der westfalischen Steinkohlengrube " Lothringen " und der französischen Grube Clarence, die nur wenige Wochen hinter uns liegen.

Die Wucht dieser Ungluckсfälle leitet das öffentliche Urteil in doppelter Hinsicht irre. Der Bergbau ist nicht, wie vielfach angenommen wird, der gefährlichste gewerbliche Beruf, es sind anderseits auch nicht die Grubenkatastrophen, die im Bergbau die meisten Opfer erfordern. Nach sicheren Zahlen der Statistik steht von den gewerblichen Berufsgenossenschaften Deutschlands die Knappschafts-Berufsgenossenschaft, welche den gesamten Bergbau Deutschlands umfasst, hinsichtlich der Unfallgefahr erst an siebster Stelle, indem im Jahre 1909 15.38 und im Jahre 1910 14.67 entschädigungspflichtige Unfälle auf 1,000 Vollarbeiter kommen, und im Rhein.-Westf. Bergbau, ebenso auch im ganzen preussischen Steinkohlenbergbau entfallen nur etwa 10–13 Prozent der tötlichen Verunglückungen auf Explosionen, während auf den Stein- und Kohlenfall etwa 38–40 Prozent und ein etwa gleicher Prozentsatz auf die Unfälle in Schächten und Strecken entfallen.

In Bezug auf die tötlichen Verunglückungen im Bergbau ist in Deutschland der Rhein.-Westf. Bergbau mit einem jährlichen Verluste von etwa 2.25 auf 1,000 Arbeiter am schwersten belastet. Nur das Jahr 1908 zeigt infolge des Massenunglücks auf Zeche Radbod noch ein Emporschnellen der tötlichen Verletzungen auf 3 p. m., aber auch dieses Unglücksjahr erreicht nicht mehr die Höhe, die noch vor einem Menschenalter bestand. Im Jahre 1879 betrugen noch die tötlichen Verletzungen ohne Massenunglücke 3.18 auf 1,000. Noch deutlicher wird der Rückgang der tötlichen Unfälle, wenn man sie im Verhältnis setzt zu der gewonnen Kohle. Die gesamte Produk-

tion des Rhein.-Westf. Bergbaues im Jahre 1879 mit rund 20 Millionen Tonnen Kohlen forderte 253 Todesopfer; die vierfache Produktion des Jahres 1907 mit 80 Millionen Tonnen Kohlen brachte etwa die doppelte Zahl tötlicher Verunglückungen (536). Nur in dem Unglücksjahre 1908 mit der Katastrophe auf Radbod stieg bei einer Förderung von 82 Millionen Tonnen Kohlen die Zahl der tötlichen Verunglückungen auf 1,025, während im Jahre 1909 bei gleicher Produktionshöhe die Zahl der tötlichen Verunglückungen auf 889 wieder sank, das Jahr 1910 mit 86.8 Millionen Tonnen 778 Todesopfer forderte und 1911 bei einer Produktion von 91 Millionen Tonnen 819 Bergleute tötlich verunglückten. Die Fortschritte der bergbaulichen Technik sind es denen wir diesen Rückgang der tötlichen Verunglückungen verdanken.

Es kann hier nicht meine Aufgabe sein, und es würde auch die Grenzen meines Wissens weit überschreiten, auf diese Fortschritte im einzelnen einzugehen. Ich will nur daren erinnern, dass das Abbauverfahren durch Berge- und Spül- oder Schlammversatz, dass dem Lande entstammt, dessen Gastfreundschaft wir heute geniessen, in dem kurzen Zeitraum von 10 bis 12 Jahren sich in dem gesamten deutschen Kohlenbergbau eingebürgert hat und immer mehr den mit seinen Ventilationsschwierigkeiten und zahlreichen Explosionsunfällen behafteten Pfeilerbau verdrängt,[1] die gefürchteten Schlagwetterreservoir, die durch die alten verlassenen Baue gebildet wurden, beseitigt eine zuverlässige Wetterführung erleichtert und die Gefahr des Stein und Kohlenfalles vermindert. Es sei ferner noch hingewiesen auf die Einführung des systematischen Ausbaues bei der Verzimmerung der Abbaue, ein Resultat der preussischen Stein- und Kohlenfall-Kommission, die im Jahre 1906 dieser Gefahrenquelle ein intensives Studium widmete, das dem in- und ausländischen Kohlenbergbau in der Praxis wertvolle Verbesserungen gebracht hat. Auf den fiskalischen Gruben Preussens an der Saar ist die Zahl der Unfälle durch diese Gefahr infolge allgemeiner Einführung dieses Verfahrens in den letzten Jahren um etwa 50 Prozent zurückgegangen, und im Auslande bediente sich als eine der ersten die Grube Courrières vor ihrer schweren Katastrophe dieses Verfahrens mit gutem Erfolge.[2]

Die Beschränkung des Gebrauches von Schwarzpulver und Dynamit bei der Sprengarbeit auf wetterfreie Gruben, die sorgfältige Prüfung der sogenannten Sicherheitssprengstoffe auf ihre Explosionssicherheit, bevor sie zum Gebrauch in Schlagwettergruben zugelessen werden, Ladung und Schuss bei der Sprengung ausschliesslich durch erfahrene und zuverlässige Leute, sogenannte Schiessmeister, sind weitere wichtige Massregeln.

Die Grosse Gefahr, welche dem Kohlenstaub als solchem in Bezug auf Explosionsfähigkeit inne wohnt, die erst in den letzten 15 Jahren

in ihrem ganzen Umfange erkannt wurde, findet ihre wirksamste Bekämpfung durch eine intensive Berieselung mit Wasser aller staubgefährlichen Betriebe, ein Verfahren, mit dessen obligatorischer Einführung die preussische Behörde allen anderen Kohlenländern vorausgegangen ist, und in dem wohl die Zukunft noch mancherlei Wandel und Besserung bringen wird. Ich erinnere hier an das von Meissner angegebene Stossträukverfahren, dem als Vorsüge nachgerühmt werden Entgasung und Lockerung der Kohle, staubfreie und ergiebige Gewinnung und Verminderung der Sprengarbeit.

Mit dem erfreulichen Rückgang der tötlichen Verunglückungen steht in einem gewissen Widerspruche eine stete Zunahme der Unfälle überhaupt seit dem Erlass des Unfall-Vers.-Ges. im Jahre 1885. Im Oberbergamtsbezirk Dortmund, der den gesamten Rhein.-Westf. Bergbau in sich schliesst, wurden Betriebsunfälle angemeldet im Jahre 1885–86, 7,885; auf 1,000 Arbeiter, 75.88; auf den Arbeitstag, 26.28. In steter Zunahme erreichte im Jahre 1910 die Zahl der angemeldeten Unfälle 53,654; auf 1,000 Arbeiter, 155.67; auf den Arbeitstag, 178.85. Aus den Berichten der Berufsgenossenchaft ist auch ersichtlich, dass vorwiegend eine Zunahme erfahren haben die Unfälle, welche durch Fahrzeuge, Beförderung von Lasten und Gebrauch von einfachen Handwerkszeugen veranlasst sind, während bei der eigentlichen bergmännischen Arbeit, Schiessarbeit ect. die Zahlen keine Verschlechterung aufweisen.

Es ist zweifellos, dass eine scheinbare Zunahme der Unfälle seit dem Erlass des Unfall-Vers.-Ges. dadurch bedingt ist, dass unwesentliche Verletzungen, leichte Quetschungen und Verstauchungen, welche früher unbeachtet blieben, nunmehr zur Anmeldung gelangten, und dass nicht selten Gesundheitsstörungen, die mit einen Unfalle tatsächlich in einem ursächlichen Zusammenhange nicht stehen, und zum Teil den Charakter der Berufskrankheiten haben, wie Lumbago, rheumatische Schmerzen der Gelenke und Muskeln, zahlreiche Hernien, Lungen- und Magenblutungen, Betriebsunfällen zur Last gelegt werden. Wenn man diese Zahlen auch nicht gering bewerten will, so bleibt es doch ausser Zweifel, dass neben dieser scheinbaren Zunahme der Unfälle auch eine tatsächliche Zunahme der Unfälle besteht, für die an erster Stelle der Umstand verantwortlich zu machen ist, dass der schnelle Aufschwung des Bergbaues die Einstellung vieler ungeschulter Arbeiter erforderte. Für diese Annahme spricht schon der Umstand, dass die staatlichen Bergwerke an der Saar in ihrem ruhigen Betriebe mit vorwiegend einheimischen Arbeitern im Jahre 1910 nur eine tötliche Unfallziffer von 0.9 auf 1,000 gegenüber den 2,245 auf 1,000 des Rhein.-Westf. Bezirks aufweist. Als direkt beweisend betrachten wir die Tatsache, dass im Rhein.-Westf. Bezirk die nicht einheimischen Arbeiter eine viel grössere Unfallziffer aufweisen, als die einheimischen Bergleute.

Unter den Arbeitern des Rhein.-Westf. Bezirks befinden sich etwa 40 Prozent Ausländer und aus dem Osten des Reiches eingewanderte, meist polnisch sprechende Arbeiter. Es wurden verletzt im Jahre 1910 auf 1,000: Ausländer, 217; Reichsangehörige aus dem Osten, 172; einheimische Arbeiter, 165.

Der moderne Bergbau mit seinen zahlreichen maschinellen Einrichtungen stellt grosse Anforderungen an die geistige und moralische Qualität der Arbeiter, er fordert grosse Zuverlässigkeit, Aufmerksamkeit, Umsicht und Besonnenheit. Unzureichende Kenntnis der bergmännischen Gefahren, geringere Intelligenz und Aufmerksamkeit, unzureichende Sprachkenntnis müssen dazu führen, dass Gefahren und Vorschriften im Betriebe unzureichend gewürdigt und beachtet werden. Ob noch nebenher in gleicher Richtung wirkend ein grösserer gewohnheitsmässiger Alkoholgenuss der verschiedenen Arbeiterkategorieen mit seiner die Merkfähigkeit und Besonnenheit einschränkenden Wirkung in Betracht kommt, ist eine Frage, die noch weiterer Prüfung bedarf.

Ist unsere Auffassung richtig, so muss ein ähnliches Verhalten der Unfallziffern in all denjenigen Bezirken nachweisbar sein, in denen wie in Westfalen infolge des raschen Aufschwunges des Bergbaues die Heranziehung zahlreicher ungeübter Arbeiter notwendig wurde. Günstiger dagegen werden die Verhältnisse liegen in bergbaulichen Betrieben mit ruhiger Entwickelung und beruflich geschulten Arbeitern. Zutreffende Vergleiche werden aber sehr erschwert durch die grosse Verschiedenheit der Verhältnisse in selbst räumlich benachbarten Gebieten. Vielleicht erklärt sich aus diesem Umstande zum Teil die Tatsache, dass die Zahl der Explosionen in Belgien trotz des hohen Gasgehalts der Kohle viel geringer ist als im Rhein.-Westf. Bezirk—gleich sorgfältige Zählung vorausgesetzt. Im Jahre 1906 und 1907 ereigneten sich im Belgischen Bergbau keine Explosionen, während im Jahre 1906, 21; im Jahre 1907, 20 Explosionen im Rhein.-Westf. Bezirk gezählt wurden.

Die Ansicht, dass fortschreitende Ermüdung die wichtigste Quelle der Betriebsunfälle bilde, findet keine Stütze bei der Zusammenstellung der Unfälle nach der Zeit ihres Eintrittes weder in Bezug auf die Tage der Woche, noch bezüglich der Schichten und Ueberschichten. Sie steht auch in Widerspruch mit der grossen Unfallziffer des Rhein.-Westf. Bergbaues gegenüber den anderen Bergbaurevieren Deutschlands, wenn man berücksichtigt, dass der Rhein.-Westf. Bergbau mit seiner achtstündigen Schichtdauer die relativ kürzeste Arbeitszeit besitzt; wir neigen aber zu der Auffassung, dass Hast und Eile bei der Arbeit einen mitbestimmenden Einfluss auf die Häufigkeit der Unfälle haben.

Absichtliche Unfallbeschädigungen zwecks Erlangung einer Unfallrente sind gewiss selten; häufiger werden angebliche Unfälle und

schon früher vorhandene Beschädigungen vorgeführt, um eine Rente zu erlangen. Dass das Unfall-Vers.-Ges. durch das Bewusstsein, gegen Unfall versichert zu sein, Achtsamkeit und Vorsicht der Arbeiter mindert, ist eine Möglichkeit, über deren praktische Tragweite nähere Ermittelungen fehlen. Ausser Zweifel ist es jedoch, dass mit dem Unfall-Vers.-Ges. die sogenannte traumatische Neurose ihren Einzug gehalten hat und zahlreiche Verletzungen kompliziert. Dass es sich bei der grossen Verbreitung dieser Störung lediglich um eine Folge des Unfall-Vers.-Ges. handelt, beweist schon die Tatsache, dass vor dem Erlass des Gesetzes bei den gleich schweren Verletzungen des Bergbaues und unter noch ungünstigeren wirtschaftlichen Verhältnissen dieses psychisch-nervöse Krankheitsbild kaum in Erscheinung trat. Es darf auch wohl daran erinnert werden, dass Bianchi-Neapel[3] nach dem furchtbaren Erdbeben von Messina und Reggio bei seinen zahlreichen Untersuchungen keinen einzigen Fall der traumatischen Neurose ermitteln konnte, eine Beobachtung, der gegenüber die Ansicht, dass Schockwirkung und Alteration des Gefässsystems die Grundlage aller traumatischen Neurosen bilden[4] unhaltbar sein dürfte. Selbstverständlich dürfen bei der Diagnose die traumatische Neurose und Rentenhysterie nicht verwechselt werden mit Schreckpsychosen und mit den nervösen Störungen, welche nach Schädelbrüchen, Hirnquetschung und Kohlenoxydvergiftungen auftreten können.

Die erfolgreiche Bekämpfung dieser unerwarteten und unerwünschten Wirkung des Unfall-Vers.-Ges. liegt daher auch nicht allein, und nicht an erster Stelle in den Händen des Arztes.

Die grosse Unfallgefahr im Bergbau erfordert eine ausreichende Bereitstellung der ersten Hülfe und eine sorgfältige Organisation des Rettungswesens. Zu der ersten gehören ein vollständig eingerichtetes Verbandzimmer auf jeder Mine. Krankenbahren unter Tage, Krankentransportwagen über Tage und zur ersten Hülfeleistung befähigte und jederzeit disponible Kräfte. Die Verbandszimmer unter Tage zu verlegen hat keine Vorzüge, denn dadurch wird die ärztliche Hülfe erschwert und es besteht die Gefahr, dass bei grösseren Katastrophen die Einrichtungen unbrauchbar werden. Die Erfahrung hat gelehrt, dass Atmungsapparate, die einen Aufenthalt in Nachschwaden und Brandwetter gestatten, sowie Sauerstoffapparate zur Wiederbelebung in schweren Fällen Rettung bringend sich bewähren können. Die Erkenntnis, dass ein wirksamer Gebrauch der Atmungsapparate, sowie der Erfolg von Rettungsarbeiten überhaupt, eine gut ausgebildete und in steter Übung erhaltene Truppe kräftigen und gesunder Männer voraussetzt, hat schon seit vielen Jahren auf den grossen Gruben des Rhein.-Westf. Bezirks zur Bildung von Rettungswehren geführt, die jederzeit zum Eingreifen bereit und mit allen erforderlichen Apparaten ausgerüstet sind. Ich erinnere an die Hülfleistung der deutschen Rettungs-

wehren bei der Grubenkatastrophe in Courrières. Da aber nicht allein eine ständige Übung der Rettungsmannschaften, sondern auch mit Rücksicht auf die Unsicherheit und Kompliziertheit der Rettungsapparate stets eine sorgfältige Kontrolle dieser notwendig ist, können die kleineren Gruben des gleichen Vorzuges nur teilhaftig werden, wenn sie an eine Rettungscentrale Anschluss finden. Diese Erwägung führte im Jahre 1910 zur Bildung einer ausgedehnten Rettungscentrale in Rhein.-Westf. Bezirk, an die 219 Schachtanlagen angeschlossen sind, die gegenwärtig über 4,036 ausgebildete Hülfsmannschaften und 1,918 Rettungsapparate und Sauerstoffkoffer verfügt. Es ist damit eine Organisation geschaffen, die trotz ihrer kurzen Existenz schon erfreuliche Resultate aufweisen kann und zu weiterer Ausbildung und Nachbildung ermutigt.

Wenden wir uns zu den Berufskrankheiten der Bergleute und Tunnelarbeiter, so muss hervorgehoben werden, dass die weit verbreitete Ansicht, dass die Bergleute vorwiegend von Erkrankungen der Atmungsorgane heimgesucht werden, in den Erfahrungen des A. K. V. keine Bestätigung findet. Überragten doch die Erkrankungen der Verdauungsorgane der Zahl nach die Erkrankungen der Atmungsorgane jährlich um 6 bis 7,000 Krankheitsfälle; aber die Erkrankungen der Verdauungsorgane sind unabhängig von den Schädlichkeiten des Berufs, während die wichtigsten Erkrankungen der Atmungsorgane, das chron. Lungenemphysem und die Anthrakosis ausgesprochene Berufskrankheiten der Minen und Tunnelarbeiter bilden.

Die alte Ansicht, die in einer Dehnungsatrophie des Lungengewebes die primäre Ursache des Emphysems erblickt, hat durch Hofbauers[5] interessante Untersuchungen eine neue Stütze gefunden. Nach diesen Untersuchungen muss für Entstehung des Leidens an erster Stelle anstrengende Arbeit verantwortlich gemacht werden. Begünstigend wirken alle Momente, welche das Atmungsbedürfnis über die Norm steigern. In Übereinstimmung mit Hofbauers Untersuchungen finden wir daher bei Bergleuten vorwiegend das inspiratorische Emphysem der unteren Lungenlappen, und wesentlich seltener das den Glasbläsern und Musikern eigentümliche expiratorische Emphysem der oberen Lungenlappen. Es ist auch ausser Zweifel, dass die Entwickelung des Emphysems bei den Bergleuten schneller erfolgt bei muskelschwachen und schlaffen Individuen als bei robusten Personen. Die Ansicht Freund's,[6] der eine Erkrankung der Rippenknorpel und dadurch bedingte Starrheit des Brustkorbes als primäre Ursache des Emphysems annimmt, und die Auffassung Löschke's,[7] der die Toraxstarre auf chron. entzündliche Prozesse an der Wirbelsäule zurückführt, können, soweit das Emphysem der Bergarbeiter in Betracht kommt, als zutreffend nicht angesehen werden, weil meis-

* Allgemein Knappschafts Verein.

tens eine Dehnung der unteren Lungenlappen nachweisbar ist, bevor die erwähnten Skelettveränderungen eintreten. Beide Skelettveränderungen werden aber gleichfalls durch Verrichtung schwerer körperlicher Arbeit in ihrer Entstehung begünstigt. Ermüdende Körperhaltung, staubreiche und sauersoffarme Luft, katarrhalische Affektionen der Luftwege, steigern das Atmungsbedürfnis und unterstützen so die Emphysementwickelung.

Fernhaltung muskelschwacher Personen vom Bergbau, Verbesserung der Ventilation, Verminderung des Staubes müssen andererseits die Emphysementwickelung beschränken. Vor allem werden aber alle technischen Fortschritte in der maschinellen Förderung und in der Kohlengewinnung durch Arbeitsmaschinen, die die bergmännische Arbeit erleichtern als wichtig und wirksam eingeschätzt werden müssen zur Verminderung des Emphysems. Zu diesen technischen Fortschritten gehören auch die mit Pressluft getriebenen Bohrmaschinen und Bohrhämmer, die ihre Entstehung der Ingenieurkunst dieses Landes verdanken, falls bei ihnen durch Spülvorrichtung oder Luftabsaugung die Staubbildung beschränkt wird. Ohne diese Vorrichtungen bereitem sie nach Haldane's [8] Ermittelungen durch vermehrte Staubbildung den Atmungsorganen der Arbeiter neue Gefahren.

Die Zahlen des A. K. V. geben in den letzten Jahren eine Erkrankungsziffer an Emphysem von etwa 2 pro Mille während in alten Zusammenstellungen die Morbidität mit 1 bis 2 Prozent angegeben wird. Aus dieser grossen Differenz wird man ungeachtet aller Fehlerquellen der Statistik auf eine erhebliche Abnahme des Emphysems unter den Rhein.-Westf. Bergleuten schliessen müssen.

Die Anthrakosis der Lungen erreichte ihre Anerkennung als Inhalationskrankheit bekanntlich erst durch Traube und Zenker. Der noch in neuester Zeit von Vansteenberghe und Grysez [9] gemachte Versuch sie auf einen intestinalen Ursprung zurück zu führen, hat durch zahlreiche andere Untersucher einwandsfreie Widerlegung gefunden. Ich nenne nur Schultze,[10] Cohn,[11] Bennecke, Aschoff, Rawenna, Ribbert,[12] Beitzke,[13] Macieska,[14] Tzunoda,[15] sodass der Charakter der Anthrakosis als Inhalationskrankheit nicht mehr bezweifelt werden kann. Im allgemeinen wird die Anthrakosis um so häufiger und um so leichter auftreten, je dichter und feiner der Kohlenstaub, je niedriger die Gänge, je schlechter die Ventilation und je häufiger die liegende Arbeit. Aber auch die Beschäftigungsart und das Arbeitsgerät ist, wie schon erwähnt, nicht ohne Bedeutung. Als dritter Faktor ist die Individualität der Arbeiter in Rechnung zu setzen. Alter und Gesamtconstitution des Arbeiters, die Widerstandsfähigkeit der Lunge, die normale Beschaffenheit der bronchialen Schleimhaut und des Flimmerepithels sind für die Entwickelung der Krankheit bestimmende Faktoren. Kinderarbeit, wie

Wells [16] sie schildert, muss der Entwickelung der Krankheit gefahrdrohenden Vorschub leisten. Die Bestimmung des preussischen Bergbaues, der die Beschäftigung jugendlicher Personen beim Bergbau vor vollendetem 14. Lebensjahre überhaupt und vor vollendetem 16. Lebensjahre unter Tage verbietet, ist daher für die Vermeidung dieses Leidens in hohem Masse als wirksam und segensreich zu bezeichnen. In gleicher Richtung wirkt die im Rhein.-Westf. Bergbau geübte frühzeitige Invalidisierung, durch die dem Bergmanne die Möglichkeit gegeben wird, schon frühzeitig sich leichterer Beschäftigung in und ausserhalb der Grube zuzuwenden. Im A. K. V. erfolgt die Invalidisierung schon dann, wenn durch Alter oder Krankheit eine Verminderung der Arbeitsfähigkeit eingetreten ist, die ein Drittel der vollen Arbeitskraft übersteigt. In diesen sozialhygienischen Massnahmen und in der Anwendung des Berieselungsverfahrens bei der Kohlengewinnung erblicken wir die wesentlichsten Ursachen für den Erfolg, dass schwere Formen der Anthrakosis im Rhein.-Westf. Bergbau nicht vorkommen. Obgleich in der Statistik des A. K. V. schon seit acht Jahren eine besondere Rubrik für Staubkrankheiten geführt wird, ist diese bis jetzt leer geblieben. Man kann daraus naturgemäss nur den Schluss ziehen, dass schwere Fälle von Anthrakosis den westfälischen Bergbau nicht belasten, denn wir verhehlen uns nicht, dass leichte Fälle der Anthrakosis sich des Nachweises entziehen können und, dass diese, sowie auch mittlere Fälle, je nach Art und Dauer der bergmännischen Arbeit vorliegen müssen. Die leichteren Fälle von Anthrakosis sind aber für Leben und Gesundheit des Bergmannes von untergeordneter Bedeutung.

Nach zwei Richtungen hin hat die Bedeutung der Anthrakosis eine unzutreffende Beurteilung erfahren. Es wurde ihr ein Schutz gegen Tuberkulose nachgerühmt und neuerdings wird sie beschuldigt, eine Prädisposition für akute Lungenerkrankungen zu schaffen. Beide Ansichten halten einer näheren Prüfung nicht stand. Man kann zugeben, dass der reine Kohlenstaub nicht geeignet ist, die Entstehung der Tuberkulose zu begünstigen, aber nicht, dass die Tuberkulose bei Bergleuten durch die Einwirkung des Kohlenstaubes einen langsameren Verlauf nimmt, oder gar zur Heilung gebracht wird. Bei offener Tuberkulose ist daher im Interesse des Kranken und im Interesse der gesamten Belegschaft die Grubenarbeit zu untersagen.

Die Lehre vom Antagonismus zwischen Anthrakosis und Tuberkulose findet zum Teil wohl ihre Erklärung durch unzureichende Unterscheidung zwischen Tuberkulose einerseits und chron. Pneumonie und Pneumonokoniose andererseits, Krankheitsformen, die, obgleich im Wesen und Verlauf so sehr verschieden, in ihren physikalischen Symptomen grosse Ähnlichkeit zeigen können. Auch der Umstand, dass die Pigmentierung der Lunge dort am stärksten

erscheint, wo ein tuberkulöser Prozess zur Schrumpfung und Heilung gelangt ist, mag das Urteil manches Beobachters getrübt, und eine Verwechselung zwischen Ursache und Wirkung bedingt haben. Die vielfach wiederholte Behauptung, dass Kohlenstaub in feinster Verteilung das tuberkulöse Virus in seiner Wirksamkeit abschwächt,[17] ist niemals bewiesen und ist um so unwahrscheinlicher, als durch Uhlenhut's Versuche mit Antiformin die überaus grosse Widerstandsfähigkeit des Tuberkelbazillus bewiesen ist. Die Steinkohle besitzt keine antiseptische Kraft. Die in ihr schlummernden chemischen Bestandteile des Teers und der Carbolsäure werden erst lebendig bei einer Temperatur, die hoch über der menschlichen Körpertemperatur liegt.

Die tatsächlich bestehende geringe Zahl von Tuberkulösen unter den Bergleuten ist bedingt durch die Auslese bei der ärztlichen Untersuchung bei Aufnahme zur Bergarbeit und durch die Selbstauslse, indem die schwere anstrengende Arbeit schwächliche Personen von der Bergarbeit fernhält oder zur baldigen Aufgabe nötigt. Über den Verlauf der Tuberkulose entscheidet aber auch hier schliesslich die Gesamtconstitution des Kranken mit ihren Wehr- und Heilkräften.[18] Die Tuberkulose-Mortalität der Bergarbeiter Westfalens ist an sich gering, sie geht aber in ihrer abfallenden Tendenz völlig parallel der Abnahme der Tuberkulose-Sterblichkeit der Gesamtbevölkerung. In den Jahren 1903 bis 1910 sank in Preussen die Sterblichkeit an Tuberkulose von 1.97 auf 1.52, bei den Mitgliedern des A. K. V. von 1.61 auf 1.44 auf 1,000.

Es starben in Preussen an Lungentuberkulose auf 1,000 Personen im Jahre 1903, 1.97; 1904, 1.92; 1905, 1.91; 1906, 1.72; 1907, 1.71; 1908, 1.64; 1909, 1.56; 1910, 1.52.

Es starben im A. K. V. an Lungentuberkulose von Aktiven und Invaliden: 1903, 1.61; 1904, 1.55; 1905, 1.83; 1906, 1.44; 1907, 0.98; 1908, 1.43; 1909, 1.70; 1910, 1.44.

Die Auffassung Aschers und Roth's,[19] dass die Anthrakosis zu akuten Lungenerkrankungen besonders disponiere, findet in den Zahlen des A. K. V. keine Stütze; auch Gebecke [20] kommt auf grund eingehender statistischer Untersuchung aus Flügge's Institut zu einer Ablehnung dieser Meinung. Es ist wohl nicht zulässig eine gesteigerte Häufigkeit akuter Lungenerkrankungen in Städten und Industriecentren, wenn sie tatsächlich bestehen sollte, allein auf Russ und Rauch zurück zu führen. Die Gesundheitsverhältnisse der Wohnungen, der infektiöse organische Staub der Strassen, die Abhängigkeit vieler Krankheiten des Respirationsapparates von Störungen der Verdauungsorgane,[21] die Dichtigkeit der Bevölkerung und die dadurch begünstigte Übertragung von Influenza und Pneumonie [22] bilden wichtige Momente, die an Bedeutung den Kohlenstaub weit überragen.

Mit wenigen Worten möchte ich noch die angeblich bestehende relative Immunität der Bergleute gegen Carcinom berühren.

Aus Beobachtungen unter den Bergleuten in Staffortshire hat man auf eine relative Immunität der Kohlenbergleute gegen Krebs geschlossen; auch Webb und Geierswold glauben an einen Antagonismus zwischen Kohle und Krebs.[23] Zahlen, die wir im A. K. V. gewonnen haben, sind nicht geeignet, diese Ansicht zu stützen. Im Laufe eines Jahres (1910–1911) wurden bei einem Bestande von 351,188 Aktiven und 30,596 Invaliden unter 3,599 Todesfällen überhaupt 179 Todesfälle allein an Krebs der Verdauungsorgane mit Sicherheit ermittelt. Diese Erhebungen werden fortgesetzt und haben im Laufe dieses Jahres, obgleich die Feststellungen noch nicht abgeschlossen sind schon 104 Todesfälle allein durch Krebs der Verdauungsorgane ergeben. Dabei ist noch zu berücksichtigen, dass die Todesursachen der Invaliden, die wegen des höheren Lebensalters hier sehr wesentlich mit ins Gewicht fallen, nur zu unserer Kenntnis gelangen, wenn die Invaliden ihren Wohnsitz im Bezirk des Knappschafts-Vereins behalten. Schon diese wenigen Zahlen zwingen m. E. zu dem Schlusse, dass Krebserkrankungen bei den Steinkohlenbergleuten hinter der Durchschnittszahl sicher nicht zurückstehen.

M. H. Die Erkrankungen der Druckluftarbeiter, die Arteriosclerose und die Erkrankungen des Herzens infolge hoher Temperaturen der Arbeitsstätten darf ich übergehen, da diese Fragen auf diesem Congresse zum Teil schon zur Besprechung gelangten und bezgl. der ersten persönliche Erfahrungen mir mangeln. Ich bitte nun noch wenige Augenblicke bei den rheumatischen Erkrankungen verweilen zu dürfen, die nach manchen Autoren, ich nenne Moll[24] und Schirmer,[25] als die häufigsten Berufskrankheiten der Bergleute angesehen werden. Aber gerade bei diesen Erkrankungen führt die kritiklose Verwertung der statistischen Zahlen zu weitgehenden Trugschlüssen. Das wohl charakterisierte klinische Bild des akuten Gelenkrheumatismus, der seine Entstehung einer Infektion mit Streptokokken aus den verschiedensten Quellen verdankt, ist bei den Bergleuten zweifellos nicht häufiger, als bei anderen Arbeiterklassen, und unabhängig von den Schädlichkeiten des bergmännischen Berufes. Wenn in scheinbarem Widerspruche mit dieser Behauptung die Statistik des A. K. V. hohe Ziffern von akutem Gelenkrheumatismus aufweist, so kann es einem Zweifel nicht unterliegen, dass hierbei die Diagnose der alltäglichen Praxis sich mit dem klinischen Begriffe nicht dekt. Für diese Annahme spricht die geringe Zahl, die im Gegensatz zum akuten Gelenkrheumatismus der chron. Gelenkrheumatismus aufweist, die geringe Zahl der Todesfälle und die geringe Zahl der organischen Herzleiden. Nicht besser steht es mit den Zahlen des akuten Muskelrheumatismus. Erkältungseinflüsse und Anstrengung sind die beiden ursächlichen Faktoren, die

bei dieser Störung als Berufsschädlichkeiten in Betracht kommen können, von denen ich geneigt bin, die Anstrengung am höchsten zu bewerten. Leichte Druckempfindlichkeit der Muskelgruppen, Schmerzhaftigkeit bei den Bewegungen und leichte Schwellung sind die stets gleichen Symptome. Zu Fehldiagnosen geben Veranlassung die Muskel- und Gliederschmerzen bei leichten Infektionskrankheiten, die Beschwerden bei Nierenleiden und Arteriosclerose, ferner Neuritiden auf alkoholischer Basis, Intoxicationen mit Blei und ähnlichen Giften, syphilitische Veränderungen an Muskeln und Gelenken.[26] Neben den Schädlichkeiten der bergmännischen Arbeit darf man aber auch hier die Bedeutung der individuellen Konstitution nicht unterschätzen. Strongeways und Barth [27] und Laumonier [28] nehmen einen ursächlichen Zusammenhang an zwischen rheumatischen Erkrankungen und Magenstörungen, Satterlee [29] eine enge Beziehung zwischen rheumatischen Erkrankungen und Stoffwechselstörungen, indem er besonders hervorhebt, dass muskuläre Überanstrengungen Störungen im Stoffwechsel verursachen. Damit ist ein Übergang gegeben ohne bestimmte Grenze zur physiologischen Muskelermüdung mit dem ihr eigenen Ermüdungsgefühl und Ermüdungsstoffen, die Weichardt als Kenotoxine bezeichnet.

Wer der Ansicht dieser Autoren sich anschliesst, wird einen günstigen Einfluss auf die rheumatischen Erkrankungen erwarten von den modernen Fortschritten in der bergbaulichen Technik, aber besonders hoch den Einfluss der Lebensweise und Lebenshaltung bewerten und in der Erfahrung, dass bei körperlicher Ermüdung das warme Bad die wirksamste Erfrischung bildet, eine ausreichende Begründung erblicken für die im Rhein.-Westf.-Bergbau durchgeführte obligatorische hygienische Massnahme, dass jedem Bergmann nach beendeter Schicht die Wohltat eines warmen Brausebades zuteil wird.

Nicht übergehen darf ich die unter den Bergleuten (Kohlenhauern) nicht seltene Berufskrankheit, den Nystagmus, dessen Wesen bekanntlich in klonischen Krämpfen der Augenmuskeln beruht, durch die den Augen des Bergmanns die Fähigkeit geraubt wird, fest und scharf zu fixieren. Eine allseitig befriedigende Erklärung des Leidens ist auch heute noch nicht gegeben. Man wird sich bescheiden müssen, als Entstehungsursache eine Überanstrengung der Augen anzunehmen, wobei nach unserer Ansicht weniger Gewicht zu legen ist auf das Bestreben des Kohlenhauers bei mangelhafter Beleuchtung deutlich zu sehen, als auf den Umstand, dass die Augen des Kohlenhauers bei der Arbeit oft eine abnorme und ermüdende Stellung einzunehmen genötigt sind. Giglioli [30] sah unter ähnlichen ungünstigen Verhältnissen Nystagmus bei einen Stubenmaler und Klempner. Nach den Erfahrungen der Praxis kann der Nystagmus der Bergleute weder als Nystagmus toxikus auf eine Kohlenoxydein-

wirkung, noch als secundäres Leiden auf eine Erkrankung des Ohrlabyrinths zurückgeführt werden. Die Annahme einer coordinatorischen Neurose ist wenig vereinbar mit der grossen Differenz in der Häufigkeit des Leidens in den verschiedenen Bergbaubezirken. Nuel[31] schätzt auf Nystagmus bei 15 bis 20 Prozent der belgischen Bergleute, Rominée[32] gibt noch ungünstigere Zahlen. Vielleicht ist bisher nicht ausreichend gewürdigt die Blendung, der das Auge des Bergmanns beim Gebrauch der nach allen Seiten gleichmässig leuchtenden Wetterlampe ausgesetzt ist, ein Uebelstand dessen Beseitigung der Tecknik nicht schwer fallen kann. Dass andere Augenleiden, Trübungen der Hornhaut. Trübung des Glaskörpers, überhaupt Schwachsichtigkeit die Entwickelung des Leidens begünstigen, ist durch zahlreiche Erfahrungen sicher gestellt.

Allgemeine Körperschwäche. Blutarmut, sowie Alkoholismus sollen einen günstigen Boden für die Entwickelung der Krankheit bilden. Es ist auch nicht ausgeschlossen, dass hohe Temperatur der Arbeitsstelle, zugleich mit körperlicher und geistiger Abspannung auch diese Erschöpfungskrankheit in ihrer Entstehung begünstigt. Die theoretische Möglichkeit, dass die durch Nystagmus bedingten Sehstörungen zu Unglücksfällen Veranlassung geben können, kann nicht bestritten werden, hat aber in der Praxis ausreichende Bestätigung nicht gefunden. Wir konnten auch nicht die Annahme Snell's[33] bestätigen, dass die Nystagmuskranken erst in der Lage sind Schlagwetter zu erkennen, wenn das Gasgemisch bereits einen explosiblen Charakter angenommen hat. Einwandfreie Untersuchungen einer Anzahl Nystagmuskranker hat uns das Resultat ergeben, dass diese Leute sämtlich imstande waren, an der Benzinsicherheitslampe einen Schlagwettergehalt zwischen 2 und 3 Prozent mit Sicherheit zu erkennen. Es bleibt aber immerhin eine zweckmässige Forderung, dass Grubenbeamte und Arbeiter, die als Wetterkontrolleure oder Feuermänner Verwendung finden, praktisch auf die Zuverlässigkeit ihrer Augen geprüft werden. Der A. K. V. hat die Bestimmung, dass an Nystagmus leidene Arbeiter unter Tage nicht beschäftigt werden sollen und während der Dauer ihrer Krankheit Krankengeld und Invalidenpension beziehen. Prophyslaktisch wirkt die Bestimmung, dass Personen, deren Sehvermögen $\frac{1}{2}$ des Normalen nicht erreicht, zur Bergarbeit unter Tage nicht zugelassen werden dürfen. Heilung erfolgt nur bei Aufgabe der Grubenarbeit und bietet, falls diese rechtzeitig und auf einen längeren Zeitraum hin erfolgt, keine ungünstige Prognose.

M. H. Gestatten Sie mir noch wenige Worte über die sogenannte Anaemia montana. Dass die Minenarbeit eine besondere Form von Blutarmut erzeuge, ist eine Ansicht, die noch heute ihre Anhänger findet. Chron. Kohlensäureintoxikation soll das Wesen der Krankheit bilden. Mangelhafte Hautkultur, Durchnässung und Erkältung

sollen die Entwickelung der Krankheit fördern; auch dem Mangel an Sonnenlicht während der Arbeit und der Nachtarbeit[35] hat man eine Bedeutung zugeschrieben. Nach unseren Erfahrungen und Beobachtungen in Rhein.-West. Bergbau gibt es keine besondere bergmännische Blutarmut. Bei kritischer Prüfung aller Berichte über diese Krankheit liegt die Deutung nahe, dass allein auf grund des vorherschenden Symptoms der Blutarmut in ihrem Wesen sehr verschiedene Krankheiten unter diesen gemeinsamen Krankheitsnamen zusammengefasst wurden (tiefgreifende Ernährungsstörungen im jugendlichen Alter und schwere Krankheitszustände infolge von Tuberkulose, Emphysem, Anthrakosis u. s. w.); auch ist es wohl zweifellos, dass die Anchylostomiasis irrigerweise dieser Krankheit zugezählt wurde, und man wird vorbehaltlos Leichtenstern[37] beistimmen können, dass die verschiedenen Epidemien von Blutarmut unter den Bergleuten in vorigen Jahrhundert Anchylostomiasisepidemien gewesen sind.

Auf die Anchylostomiasis selbst, die wir wenigstens für Deutschland als eine ausgesprochene Berufskrankheit der Bergleute ansehen müssen, möchte ich nicht mehr eingehen. Ich will mich darauf beschränken, hervorzuheben, dass nach unseren Erfahrungen ein mässiger Salzgehalt der Grubenwässer das Auftreten der Krankheit nicht verhindert und dass wir mit Rücksicht auf die geringe Beweiskraft des negativen Resultates der mikroskopischen Kotuntersuchung Sauberkeit im Gruben-Betriebe und die Beschaffung ausreichender Abortanlagen unter Tage für die wichtigste hygienische Massnahme zur Bekämpfung dieser Krankheit halten. Die neuesten Untersuchungen im Gelsenkirchener Institut durch Bruns[38] haben erwiesen, dass die mikroskopische Kotuntersuchung, auch unter Benutzung der Modifikationen von Telemann und Quadflieg[39] durch das von Loos ursprünglich angegebene Züchtungsverfahren von Larven an Zuverlässigkeit mehrfach übertroffen wird. Dieses Verfahren eignet sich aber, abgesehen von der Infektionsgefahr für den Untersucher, wegen seiner Umständlichkeit und Schwierigkeit nicht für die alltägliche Praxis.

M. H. Ich bin am Ende meiner Ausführungen. Die Gesundheitsverhältnisse der Bergleute zeigen nach unserer Ansicht eine fortschreitende Besserung, aber so lange der Mensch Kohle und Erz, die Hebel der modernen Kultur aus dem dunklen Schosse der Erde in emsiger und mühsamer Arbeit gewinnt, werden den Bergmann Gefahren umdrohen. Weitere Fortschritte der nie rastenden Technik, unterstützt von einem wachsenden Verständnis für bergpolizeiliche Vorschriften sanitäre Massnahmen und hygienische Lebensführung von seiten der Arbeiter werden an erster Stelle dazuführen, die Gesundheitsverhältnisse der Bergleute immer noch günstiger

zu gestalten. Dass auch in diesem Sinne die Verhandlungen dieses Congresses förderlich sein mögen, das ist mein Wunsch.

---

[1] Baum, Der Steinkohlenbergbau und seine Gefahren, S. 21.

[2] Baum, Ebendaselbst, S. 72.

[3] Galli-Rapallo, Klinische Beobachtungen über die Folgen des Erdbebens von Messina. Münchener med. Wochenschrift, 1909, No. 26.

[4] Ewald, Die traumatische Neurose und die Unfallgesetzgebung, Beiheft No. 12 d. med. Klinik, 1908.

[5] Hofbauer & Holzknecht, Zur Physiologie und Pathologie der Atmung. Mitteilungen aus d. Laboratorium für radiolog. Diagnostik u. Therapie im K. K. allgem. Krankenhause in Wien, 1907, Heft 2. Hofbauer, Zeitschrift für experim. Path. u. Therapie, III, 3, 1906, u. V, 7, 1908.

[6] Freund, Berlin. klin. Wochenschrift, 1902.

[7] Loeschke, Deutsch, med. Wochenschrift No. 20, 1911.

[8] Haldane, Martin, Thomas, Report to the Secretary of State for the Home Department on the Health of Cornish Miners, 1904.

[9] Vansteenberge et Grysez, Sur l'origine intestinale de l'anthracose pulmonaire. Annales de l'Institut Pasteur, XIX, 12, 1905.

[10] Schultze, München. med. Wochenschrift, 1906, No. 35.

[11] Cohn, Berl. Klin. Wochenschrift, 1906, Nos. 44, 45.

[12] Ribbert, Deutsch. med. Wochenschrift, 1906, No. 40.

[13] Beitzke, Virchow Archiv, 1906, S. 183.

[14] Macieska, Wiener klin. Wochenschrift, 1909, No. 14.

[15] Tsunoda, Deutsch. med. Wochenschrift, 1909, No. 26.

[16] H. G. Wells, Die Zukunft in America cit. nach Münch. med. Wochenschrift, 1912, No. 6.

[17] Fabry, Über die bei Bergleuten in Kohlenbergwerken beobachtete verruköse Form der Hauttuberkulose. Münch. med. Wochenschrift, 1909, No. 35.

[18] McCarthy, Francis P., The Influence of Race in the Prevalence of Tuberkulosis. Boston Med. and Surg. Journal, 166, pp. 207–211, 1912.

[19] Ascher, Die Einwirkung von Rauch und Russ auf die menschliche Gesundheit. Deutsch. med. Wochenschrift, 1909, No. 14. Roth, Compendium der Gewerbekrankheiten, 1909.

[20] Gebecke, Zeitschrift für Hygiene u. Infektionskr., Bd. 68, Heft I, S. 105.

[21] Loude, Über den digestiven Ursprung der Krankheiten des Respirationsapparates. Rev. d. Medic., 1909, No. 6, cit. u. klin. therap. Wochenschrift No. 28, Jahrg. XVI. Pelmar-Prag, Perityphilitis und Lungenentzündung. Centralblatt für innere Med., 1909, No. 35.

[22] Leede, C., Pneumokokken-Influenza. Zeitschrift f. Hygiene u. Infekt. Krankheiten, 71, S. 439–471, 1912. Palier, A Few More Words Concerning Nice and Pneumonia. New York Med. Record, 1906, Jan. 27. Selter, Zeitschrift für Hygiene und Infektion, LIV, 3, 1907.

[23] Azema, Pneumonia par contagion. Gaz. des Hôp., Jan., 1907. Olivier, The outbreak of pneumonia in a reformatory school. Lancet, July, 1906. Selig, Wien. klin. Wochenschrift, XX, 5, 1907.

[24] Sticker, Findet eine Beeinflussung des Krebses durch Kohle statt? Münch. med. Wochenschrift, No. 50, 1909.

[25] Moll, Die Krankheiten der Bergarbeiter. Dissertation. Berlin, 1869.

[26] Schirmer, Die Krankheiten der Bergleute in den Grünberger Braunkohlengruben. S. 307.

[27] Heckmann, 1. Zur Aetiologie der Arthritis deformons. Münch. med. Wochenschrift, No. 31, 1909; 2. Etiology of Arthritis deformans. Med. Record, 1909, No. 23.

[27] Strongeways & Barth, A report on some points in the etiology of so-called Rheumatismus arthritis. Bull. of the Committee for the Study of Special Diseases at Cambridge.

[28] Laumonier, La question de 'larthritisme. Bull. gén. de thér., 1908, p. 597.

[29] Satterlee, Rheum. poison and its treatment. New York & Philad. med. Journal, 1905, p. 625.

[30] Giglioli, Verhandlungen des II. Internationalen Congresses für Gewerbekrankheiten zu Brüssel, 1910.

[31] Nuel, Ebendaselbst.

[32] Rütten-Liege, Le nystagmus professionnel des houilleurs. Presse méd. belge, LIX, 52, 1907.

[33] Snell, Zeitschrift für Berge-, Hütten- und Salinenwesen im Preuss. Staate, 1909, Bd. 57, Heft, 3, S. 348.

[34] Eulenberg, Die Lehre von den schädlichen und giftigen Gasen, 1865, S. 676.

[35] Papenheim, Handbuch der Sanitätspolizei, S. 292.

[36] Laget, Allgemeine und spezielle Gewerbepathologie, Deutsch von Meinel, 1864, S. 318.

[37] Füller, Handbuch für Hygiene v. Th. Weyl, VIII. Bd. S. 346.

[38] Bruns, Bericht des Instituts für Hygiene und Bacteriologie zu Gelsenkirchen 1908–1909, S. 37.

[39] Telemann, Eine Methode zur Erleichterung der Auffindung von Parasiteneier in den Faeces. Quadflieg, Ein Beitrag zur Faecesuntersuchung auf Parasiteneier. Deutsch. med. Wochenschrift, 1909, No. 48.

Einige Zahlen aus der Statistik des Allgemeinen Knappschaftsvereins.

Jahr.	Mittlere Zahl der Belegschaft.		I. Akuter Gelenkrheumatismus.		II. Chronischer Gelenkrheumatismus.		III. Herzfehler.		IV. Muskelrheumatismus.		V. Rückenmarksschwindsucht.		VI. Neuralgie (Tschias).		VII. Augenzittern.	
			Anzahl.	Auf tausend (pro mille).	Anzahl.	Auf tausend (pro mille).	Anzahl.	Auf tausend (pro mille).	Anzahl.	Auf tausend (pro mille).	Anzahl.	Auf tausend (pro mille).	Anzahl.	Auf tausend (pro mille).	Anzahl.	Auf tausend (pro mille).
1911	357,321	Krank	3,482	9.74	196	5.48	449	1.26	30,008	83.98	.....	.....	3,391	9.49	1,356	3.79
		Gestorben	4	.011	.....	.....	22	.06	3	.008	.....	.....	1	.003	.....	.....
		Invalide	37	.10	6.32		59	.16	152	.42	9	0.02	36	.10	797	2.23
1910	351,188	Krank	3,135	8.93	4.81		510	1.45	29,746	84.73	3	.01	3,369	9.59	1,421	4.05
		Gestorben	5	.014	.....	.....	22	.06	1	.003	4	.01	.....	.....	.....	.....
		Invalide	52	.15	232	6.61	46	.13	151	.42	9	.02	48	.14	824	2.35
1909	348,389	Krank	2,982	8.56	131	3.76	347	1.00	29,712	85.28	2	.005	3,160	9.07	1,459	4.19
		Gestorben	6	.02	.....	.....	27	.08	.....	.....	.....	.....	.....	.....	.....	.....
		Invalide	62	.18	239	6.86	55	.16	176	.50	6	.02	48	.14	757	2.17
1908	343,325	Krank	2,672	7.78	302	8.08	341	.99	25,370	73.89	.....	.....	2,845	8.29	947	2.76
		Gestorben	3	.01	.....	.....	25	.07	1	.003	.....	.....	.....	.....	.....	.....
		Invalide	11	.03	168	4.89	38	.11	121	.35	1	.003	34	.10	406	1.18

Jahr.	Mittlere Zahl der Belegschaft.		VIII. Lungentuberculose.		IX. Krankheiten der Respirationsorgane.		X. Lungenentzündung.		XI. Staubkrankheiten.		XII. Emphysem, Asthma.		XIII. Krankheiten des Verdauungsapparates.		XIV. Anchylostomiasis.	
			Anzahl.	Auf tausend (pro mille).	Anzahl.	Auf tausend (pro mille).	Anzahl.	Auf tausend (pro mille).	Anzahl.	Auf tausend (pro mille).	Anzahl.	Auf tausend (pro mille).	Anzahl.	Auf tausend (pro mille).	Anzahl.	Auf tausend (pro mille).
1911	357,321	Krank	237	0.66	28,954	81.03	1,774	4.96	.....	.....	689	1.93	39,725	111.17	1,166	3.26
		Gestorben	264	.74	433	1.21	318	.89	.....	.....	20	.06	101	.28	.....	.....
		Invalide	242	.68	589	1.65	2	.01	.....	.....	311	.87	171	.48	.....	.....
1910	351,188	Krank	212	.60	26,204	74.61	1,473	4.19	.....	.....	666	1.90	32,527	92.62	1,306	3.72
		Gestorben	276	.78	356	1.01	259	.74	.....	.....	20	.06	94	.27	.....	.....
		Invalide	220	.63	720	2.05	3	.01	.....	.....	379	1.08	138	.39	1	.003
1909	348,389	Krank	163	.47	27,528	79.01	1,637	4.70	.....	.....	568	1.63	33,093	94.99	968	2.78
		Gestorben	305	.87	426	1.22	333	.95	.....	.....	19	.05	95	.27	.....	.....
		Invalide	202	.58	762	2.19	4	.01	.....	.....	444	1.27	121	.35	.....	.....
1908	343,325	Krank	263	.77	23,039	67.10	1,563	4.55	.....	.....	527	1.53	31,501	91.75	1,169	3.40
		Gestorben	272	.79	403	1.17	345	1.00	.....	.....	18	.05	100	.29	.....	.....
		Invalide	150	.44	515	1.47	5	.01	.....	.....	293	.85	111	.32	.....	.....

66692—VOL 3, PT 2—13——14

DISCUSSION.

Dr. R. M. Cunningham, Alabama: I concur, in the main, with the remarks of Dr. Lindemann, for the understanding of which I am indebted to the abstract of his address. I believe that anthracosis is almost universal in old coal miners and that it does not particularly affect the health so far as tuberculosis, pneumonia, and so forth, are concerned. Among old miners ephysema and moderate fibrosis of the lungs are present. The mining industry of Alabama bears the same relation to the Northern States in point of time as does that of the United States to that industry in Europe. Briefly, the mining industries in Alabama have been of importance for not more than 30 years. In the beginning cheapness and economy in the development and operation of coal mines were the rule. There has been, however, many changes for the better, so that to-day the majority of the mines in Alabama are scientifically opened and operated and are under good sanitary conditions. In addition to this, the homes and the environments of the employees have been greatly improved. This is particularly true of the mines operated by the Tennessee Coal, Iron & Railroad Co., the largest single industry of the Southern States. All houses that are now being built provide for proper sanitary conditions and comfort, and regulations have been adopted and executed that insure good hygiene in and around the home, consisting chiefly of sanitary closets, pure water, food supply, and general cleanliness in and around the works and homes of the employees.

In an investigation made by me in October of last year, out of a population of about 35,000 people, consisting of employees of the Tennessee Coal, Iron & Railroad Co. and their families, there were only about 140 cases of typhoid fever during the year, and nearly all of these lived, not in company houses, but in the near-by incorporated cities and towns over which the company has no control. From my personal experiences, excepting the tragedies of accidents, outside conditions have contributed more to disease than inside conditions. I am glad to report that in Alabama, in the Birmingham district, the officers of the industrial corporations of all kinds are taking a great interest in and are spending large sums of money to better the living conditions of their employees and to render as safe as possible the operating conditions of their industries.

I feel confident in predicting that hereafter the spirit of ethics and humanity will more largely control than ever in the past, and that the captains of industry will willingly follow the lead of science in the betterment of the living conditions of their employees, which is preferable to being driven to do so by the authority of law.

DISEASES AND ACCIDENTS OF MINERS AND TUNNEL WORKERS IN THE UNITED STATES.

Dr. Joseph A. Holmes, Director, United States Bureau of Mines, Washington, D. C.

When one realizes that the mining industry of this country has nearly doubled in magnitude during each 10 years of its development, the fact that the development of the industry has not always been symmetrical becomes readily intelligible. The industry has grown so rapidly that there has not been time for full and mature organization; and, when this fact is understood, one is not surprised that in the United States questions of safety and health in mining as well as in other industries have been long neglected.

In a country like the United States, in which there is lack of continuity in the higher personnel of governmental offices, one is not surprised that governmental activities, instead of being in advance of public opinion, are usually a result of and a part of an awakening to the existence of conditions which need to be improved and regulated; and which the public believes can be improved or regulated better by governmental than by private agencies.

As a part of, and as one of the results of, the general movement in the United States in behalf of greater safety and better health conditions, Congress has recently established a Public Health Service to deal with national phases of epidemics of contagious diseases; a Bureau of Labor, which deals with general labor conditions throughout the country; and a Bureau of Mines—established only two years ago—for the conduct of inquiries and investigations looking to the improvement of conditions affecting health and safety in the different branches of the mining industry. Furthermore, in each of the more important States, there have been established improvements in local conditions, a State board of health, a State bureau of labor, and a State system for the inspection of mines. Consequently there is not only ample opportunity for the three branches of the Federal service named above to cooperate with each other; but there is also ample opportunity for each of these to cooperate with similar State institutions created for the accomplishment, within more circumscribed limits, of the same general purposes.

THE WORK OF THE BUREAU OF MINES.

The two chief purposes of Congress in creating the national Bureau of Mines are, lessening the loss of life and lessening the waste of resources in the various branches of the United States mining industry. In connection with the lessening of the loss of life, Congress has specifically assigned among the duties of the bureau the conduct of inquiries and investigations looking to the improvement of health

conditions and the improvement of safety conditions in the mining industry.

Investigations looking to the improvement of safety conditions in coal mining have thus far received the larger share of attention; and in connection with this phase of the subject a special endeavor has been made to determine the causes of and the feasible means of preventing mine explosions. In this connection an extended series of investigations has been conducted concerning the explosives used in mining with the view to obtaining for use in the more dangerous coal mines a type of explosives, termed permissible explosives, that are less likely than black powder to ignite either coal dust or inflammable gas, and produce, when exploded in the mines, smaller quantities of poisonous fumes or gases dangerous to the health of miners. Though its development is based on no semblance of authority, but simply on the influence of a recommendation backed by public opinion, this new type of explosives has, within a brief period of time, been generally introduced in all of the more important coal-mining regions of the United States.

In its study of gas and dust explosions, the bureau has established and equipped not only laboratories but an experimental mine. In the latter, the recommendations suggested by laboratory results are given practical trial before being submitted for adoption by the mine owners of the country. Other investigations organized and under way relate to electric equipment in mines, mine supports, mine haulage, mine-safety appliances, mine signals, and so forth. But a number of these investigations have been started too recently to warrant expecting highly beneficial results for months or even for several years to come. Moreover, the funds at the disposal of the bureau are inadequate for pushing the work along all of these lines.

It is encouraging, however, to know that in all of this work the engineers and chemists of the Bureau of Mines are receiving the hearty cooperation of both the miners and the mine owners of the country and of the State mine inspectors. Furthermore, there has been held at Pittsburgh, Pa., during the past week, the first of a series of international conferences of the directors, engineers, and chemists of the mining experiment stations in different countries; and hereafter there may be expected a larger cooperation among the representatives of the different countries in all work on behalf of mine safety.

STATISTICS OF MINE ACCIDENTS.

In addition to the investigations mentioned above, the Bureau of Mines is endeavoring to cooperate with the States and with private corporations in the collection of full and accurate statistics of mine

accidents. The statistics of coal-mine accidents are being collected on a fairly satisfactory basis by the mine inspectors in many of the coal-mining States, but in the work many difficulties have been met, and no one understands better than the inspectors themselves the fact that the results in many cases are not altogether satisfactory.

Yet every year sees an improvement, and it is hoped that within the next few years not only the system of collection but the statistics themselves will be considered reasonably complete and reliable by the entire coal-mining industry of the country.

In metal mining and quarrying the statistics of accidents are far from what they should be. A number of the States have done nothing whatever to collect such statistics. The preliminary efforts of the Bureau of Mines to collect such statistics have thus far been unsatisfactory, the funds at the disposal of the bureau for undertaking this inquiry in a satisfactory manner being entirely inadequate.

ACCIDENTS IN UNITED STATES COAL MINES.

The available statistics of coal-mine accidents in the United States are of especial interest in this connection, as indicating the lines along which investigations and more stringent legislation are needed. Thus in the underground accidents in the coal mines of the United States during the year ended December 31, 1911, statistics show that the fatalities caused by mining machines and mining machinery other than mine locomotives, or by animals, or by suffocation from mine gases, or by " blown out " or " windy " shots, were each less than 1 per cent of the total, whereas 3¼ per cent of all fatalities underground were ascribed to mine fires, 3½ per cent to electricity, 5½ per cent to explosives, 15 per cent to mine explosions (including both gas and dust explosions), 16 per cent to mine cars and locomotives, and 53½ per cent to falls of roof and falls of coal. Of the total fatal accidents connected with coal-mining operations during 1911, about 91 per cent took place underground, 2⅓ per cent in the shaft, and the remainder, 6⅔ per cent, happened in the course of work on the surface about the mines.

In the investigations of the Bureau of Mines during the past two years the larger share of attention has been given to the causes and prevention of mine explosions, although, as is shown by the figures just given, these explosions caused only 15 per cent of the total number of fatal accidents underground during the past year. The reason for giving such attention to mine explosions has been that, in other mine accidents, men are killed here and there, singly or in small numbers, and from causes that have to do largely with indi-

vidual miners; whereas, in the case of mine explosions, as frequently in connection with mine fires, conditions exist that may kill hundreds of men in a few minutes.

However, the investigations of the bureau have been extended, as rapidly as appropriations for its work permit, to all the causes of mine accidents.

The accompanying statistical data indicate that, whereas prior to 1907 there was a fairly continuous increase, not only in the aggregate, but also in the proportionate number of men killed in the coal mines of the United States, yet during the past two years there has been a slight improvement in the death rate from accidents, whether this rate is based on the number of men killed for each 1,000 employed or on the number killed for each 1,000,000 tons of coal mined. The statistical tables also indicate that, although upon the basis of the number of men killed for each 1,000 men employed, the death rate from accidents in coal mines was for the years 1901–1910, 3.74 for the United States, as compared with 0.96 for India, 1.02 for Belgium, 1.04 for Austria, 1.69 for France, 1.36 for Great Britain, 2.11 for Germany, and 2.92 for Japan. On the basis of the number of men killed for each 1,000,000 tons of coal mined, the death rate for the same period was 5.83 for the United States, as compared with 4.40 for Great Britain, 5.05 for Austria, 5.56 for Belgium, 7.55 for Germany, 7.79 for France, 9 for India, and 22.71 for Japan.

WHY THERE ARE MORE MINE ACCIDENTS IN THE UNITED STATES THAN IN ANY OTHER COUNTRY.

I am frequently asked the question, especially by European mining engineers, why it is that, in proportion to the number of men employed, mine accidents are so much more numerous in the United States than in other countries. Conditions do not permit a full discussion of this question in the present paper, but I may present briefly the following factors as especially worthy of consideration at this time:

1. The industry has developed rapidly and is in an unorganized condition. A large proportion of the coal miners in the United States understand neither the language, nor the laws, nor the institutions of this country, and many of these men on entering our mines have had no previous acquaintance with either mining operations or with mining traditions. At many of our mines the ordinary rules and regulations must be printed in from three to eight different languages, and often in the same mine there will be at work at the same time miners of from 10 to 20 different nationalities.

2. The rules and regulations differ in detail at mines operated by different companies in the same coal field, in different coal fields, and in the different States; furthermore, no two States have the same mining laws. Many miners migrate frequently, not only from mine to mine and from district to district, but from State to State.

3. The system under which bituminous-coal mining in the United States is being conducted at the present time is one of severe competition, not only between different coal fields in different States, but between the different companies in each of the coal fields. The profits of the business are not such as to warrant the expenditure necessary for storage facilities at the mines, although the demand for the coal is greater during the winter than during the summer season, and this increased demand must be met by more extensive mining during the winter months. This fact and the general conditions of competition and labor have resulted in the development of mines and mining facilities capable of producing annually half again as much coal as is actually needed by the country. Furthermore, each individual miner in the United States during each day that he is at work produces three times as much coal as is produced daily by each miner in Great Britain. In consequence of the productive capacity there is frequent forced idleness at the mines; and as a result the soft-coal mines during the past few years have been operated only from 210 to 220 days during the year, as compared with a fairly constant operation for 300 days during each year in Great Britain and other European countries.

The above conditions and others which can not now be discussed help to encourage wasteful, unsafe, and unsanitary mining methods.

The preceding discussion serves to throw light on the coal mining situation as it exists in the United States to-day; but the facts stated are not offered as an excuse or an apology for the large list of fatalities. The seriousness of the situation is frankly admitted. The killing of 30,000 and the injuring of probably five times as many men in the mines and quarries of the United States during the past 10 years is plainly to our national discredit. Both our miners and mine owners are awake to the situation and are showing a commendable desire and determination to cooperate in a way to lessen this loss of life. But they need the cooperation of the statesmen of the country no less than that of the Bureau of Mines.

HEALTH CONDITIONS IN UNITED STATES MINES.

Health conditions in United States mines have been neglected, both by the State and Federal Governments, even more than matters relat-

ing to mine accidents; but plans are already under way which, it is believed, will soon result in effective cooperation between Federal, State, and private agencies, and will start an improvement in health conditions, not only at the mines, but at the various plants connected with the metallurgical and other mineral industries of the country.

During the past year preliminary inquiries begun through the cooperation of the Bureau of Mines and the Public Health Service showed the prevalence of lung troubles (silicosis) in a number of metal mines, especially those in which the ores are silicious in character. These inquiries also indicated that the hookworm disease (ankylostomiasis) has found its way into a number of the more southern coal mines, and has been reported in a few gold mines.

Furthermore, in this preliminary investigation the sanitary conditions in many of the mines have been found to be such as will promote the development of other diseases which may be directly or indirectly associated with miners' occupations.

The excellent ventilation of the coal mines of the country, developed with especial reference to the removal of explosive and noxious gases coming from the coal, from explosives, or from other sources in the mines, is one of the important agencies in bringing about the generally excellent condition of the coal mines in respect to healthfulness.

In many metal mines and tunnels, on the other hand, ventilation is wholly inadequate, being dependent only on the natural circulation of the air, with the result that the bad effects of the poisonous gases coming from explosives and other sources are often apparent. Furthermore, up to the present time no strong concerted effort has been made in most of the metal mines of the country toward keeping down the dust, which, in the silicious mines (as in the Transvaal and other mining countries), has been found to produce serious lung troubles.

In cooperation with the Bureau of Labor, the engineers and chemists of the Bureau of Mines have been making preliminary inquiries regarding health conditions in plants for treating ores and other minerals. Following up these inquiries, plans are now being matured for a more thorough investigation into health conditions and the means of improving health conditions both in the mining and metallurgical branches of the mineral industry.

WORK OF THE MINE-SAFETY CARS.

As a means of carrying forward both investigational and educational work looking to the improvement of both the health and safety conditions in the coal mines of the country, the Bureau of Mines has seven mine-safety cars in operation at the present time

in the different coal fields. The equipment on each car includes such examples of equipment as can be obtained from different companies for the mine rescue work and first-aid work, besides equipment for use in sanitation and fire fighting. On each of these cars are two practical, experienced miners, who have been given special training in mine rescue and first-aid methods, and one mining engineer, who is also trained in sanitary measures. The bureau also employs a surgeon and a sanitary engineer who make general inspections. These cars are constantly traveling from one mine or group of mines to another, training at each place a small number of miners in mine rescue and first-aid methods, making examinations into mining conditions, and giving illustrated lectures before miners and mine operators concerning the possibility and the methods of making a mine safer and more healthful.

Through the agency of these traveling cars it is hoped that not only a large amount of new information will be obtained, but also a large amount of educational work will be done in the way of inducing miners and mine operators to make use of such new methods and practices as will render conditions safer and more healthful at all mines.

Whenever a mine disaster occurs in any of the coal fields of the country one or two of the mine rescue cars nearer the point of disaster proceeds there immediately. The experienced miners and the mining engineer on the car, together with other miners that have been trained in the immediate vicinity, take part in the efforts to rescue miners who may have been entombed or injured in the disaster; so that the work of the cars not only serves the purpose of carrying forward both the investigational and educational efforts of the bureau, but also serves a useful purpose in time of disaster.

THE COAL-DUST PROBLEM.

In conclusion, I may add a few observations to Sir Thomas Oliver's most excellent and valuable address given last evening. Keeping in close touch with the coal-dust investigations that have been in progress during the past two or three years in England, Belgium, France, Germany, and Austria, the Bureau of Mines has been conducting investigations into the causes and possible prevention of coal-dust explosions. On the whole, its results have been similar to those obtained in other countries, as outlined by Sir Thomas Oliver.

We have begun experiments to determine, if practicable, the value of the application of stone dust, calcium and magnesium chloride, and so forth, in preventing or limiting explosions. From observations made in this country through a number of years, we now have

very little fear of dust explosions during the late spring, summer, and early autumn, for the reason that during these months the warm air entering the mine is cooled by coming in contact with the mine walls, and the contained moisture is deposited, keeping up a continuous "sweating." Thus the coal dust is so moistened that we have thus far been unable to explode it in the mine except when gas is present in sufficient quantities to start in advance a vigorous explosion. The great problem in connection with coal dust is its treatment during the cold winter months when the cool air entering the mine has its temperature raised and, instead of depositing moisture, removes both the natural moisture and any brought in for sprinkling the coal dust, leaving the dust dangerously dry.

The simplest remedy we have found for this condition is the introduction of exhaust steam from the mine power plant, in such a manner and in such quantities as to raise the temperature of the entering air and at the same time to supply it with moisture.

It is of course realized that this introduction of warm, moist air throughout the winter season may result in developing and maintaining conditions favorable to the spread of the hookworm disease, and that an atmosphere of this kind may tend to make miners work with less energy than would a drier atmosphere, but, through an experience of three years in a number of our larger coal mines, neither one of these evils has appeared, nor has there been any serious resulting trouble in the way of damage to the mine roof.

In the use of this method of humidifying mine air it is important that neither the temperature of the entering air nor the amount of moisture turned into the air in the form of exhaust steam should exceed what is necessary to accomplish the desired result. Further, it is important that the supply be continuous, as alternate increase or decrease of temperature or of moisture are likely to have injurious effects on the roof of the mine.

Statistics of coal-mine accidents in the principal coal-producing countries of the world.

[Averages from 1901 to 1910, inclusive.

	India.	Belgium.	Austria.	Great Britain.	France.	Germany.	Japan.	United States.
Number killed per 1,000 employed	0.96	1.02	1.04	1.36	1.69	2.11	2.92	3.74
Number killed per 1,000,000 short tons mined	9.00	5.56	5.05	4.40	7.79	7.55	22.71	5.88
Production in short tons	10,112,000	25,540,000	14,046,000	274,794,000	38,785,000	134,785,000	13,604,000	389,269,000
Number employed	94,346	139,597	68,288	890,434	178,749	482,132	105,924	607,438

Production, number of men employed, and number of men killed in and about the coal mines of the United States in the calendar year 1910.

State.	Production (short tons).[1]	Number employed.[1]	Number killed.			Production per death (short tons).
			Total.	Per 1,000 employed.	Per 1,000,000 short tons mined.	
Alabama	16,111,462	22,230	238	10.71	14.77	68,000
Arkansas	1,905,958	5,568	14	2.51	7.35	136,000
California and Alaska	12,164	19	0	0	0	----------
Colorado	11,973,736	15,864	323	20.36	26.98	37,000
Georgia	177,245	386	0	0	0	----------
Idaho	4,448	14	0	0	0	----------
Illinois	45,900,246	72,645	143	1.97	3.12	321,000
Indiana	18,389,815	21,878	51	2.33	2.77	361,000
Iowa	7,928,120	16,666	33	1.98	4.16	240,000
Kansas	4,921,451	12,870	17	1.32	3.45	290,000
Kentucky	14,623,319	20,316	86	4.23	5.88	170,000
Maryland	5,217,125	5,809	17	2.93	3.26	307,000
Michigan	1,534,967	3,575	6	1.68	3.91	256,000
Missouri	2,982,433	9,691	14	1.44	4.69	213,000
Montana	2,920,970	3,837	12	3.13	4.11	243,000
New Mexico	3,508,321	3,585	16	4.46	4.56	219,000
North Dakota	399,041	534	2	3.75	5.01	200,000
Ohio	34,209,668	46,641	161	3.45	4.71	213,000
Oklahoma	2,646,226	8,657	40	4.62	15.12	66,000
Oregon	67,533	153	0	0	0	----------
Pennsylvania (anthracite)	84,485,236	169,497	601	3.55	7.11	141,000
Pennsylvania (bituminous)	150,521,526	175,403	539	3.07	3.58	279,000
Tennessee	7,121,380	11,930	38	3.19	5.34	187,000
Texas	1,892,176	4,197	7	1.67	3.70	270,000
Utah	2,517,809	3,053	15	4.91	5.96	168,000
Virginia	6,507,997	7,264	57	7.85	8.76	114,000
Washington	3,911,899	6,314	43	6.81	10.99	91,000
West Virginia	61,671,019	68,663	329	4.79	5.33	187,000
Wyoming	7,533,088	7,771	38	4.89	5.04	198,000
Total	501,596,378	725,030	2,840	----------	----------	----------
Average	----------	----------	----------	3.92	5.66	177,000

[1] Parker E. W., Mineral Resources, U. S., 1910: U. S. Geol. Survey, 1911.

Number of men killed in and about the coal mines of the United States in the calendar year 1910.

State.	Killed underground.											Killed in shaft.						Killed on the surface.							Total by States.
	By falls of roof (rock, coal, etc.).	By mine cars and locomotives.	By gas or dust explosions, windy or blown-out shots.	By explosives.	By suffocation from mine gases.	By electricity (shock or burns).	By animals.	By machinery other than locomotives but including mining machines.	By gases from mine fires.	By other causes.	Total.	By falling down shafts or slopes.	By objects falling down shafts or slopes.	By breaking of cables, chains, etc.	By overwinding.	By other causes.	Total.	By mine cars and mine locomotives.	By electricity (shock or burns).	By machinery.	By boiler explosions.	By railway cars and locomotives.	By other causes.	Total.	
Alabama	55	20	139	10	....	6	....	1	....	7	238	....	....	....	....	....	0	....	....	....	....	....	....	0	238
Alaska	....	....	....	....	....	....	....	....	....	....	0	....	....	....	....	....	0	....	....	....	....	....	....	0	0
Arkansas	10	....	4	....	....	....	....	....	....	....	14	....	....	....	....	....	0	....	....	....	....	....	....	0	14
California	....	....	....	....	....	....	....	....	....	....	0	....	....	....	....	....	0	....	....	....	....	....	....	0	0
Colorado	73	18	210	5	....	....	....	....	12	....	318	2	....	....	....	....	2	1	....	....	....	....	2	3	323
Georgia	....	....	....	....	....	....	....	....	....	....	0	....	....	....	....	....	0	....	....	....	....	....	....	0	0
Idaho	....	....	....	....	....	....	....	....	....	....	0	....	....	....	....	....	0	....	....	....	....	....	....	0	0
Illinois	74	27	8	9	....	1	4	....	....	....	123	5	2	....	....	6	13	1	....	....	....	4	2	7	143
Indiana	25	6	6	9	....	1	....	....	....	....	47	3	....	....	....	1	4	....	....	....	....	....	....	0	51
Iowa	21	4	1	2	....	....	1	....	....	....	29	3	....	....	....	....	3	1	....	....	....	....	....	1	33
Kansas	7	1	1	3	....	....	....	....	....	....	12	4	....	....	....	....	4	....	....	....	....	....	1	1	17
Kentucky	21	5	50	6	1	2	....	....	....	....	85	....	....	....	....	....	0	1	....	....	....	....	....	1	86
Maryland	10	3	....	1	....	....	....	....	....	1	15	....	....	....	....	....	0	1	....	....	....	....	1	2	17
Michigan	4	....	....	1	....	....	....	....	....	1	6	....	....	....	....	....	0	....	....	....	....	....	....	0	6
Missouri	8	3	....	1	....	....	....	....	....	2	14	....	....	....	....	....	0	....	....	....	....	....	....	0	14
Montana	7	3	....	....	....	....	....	....	....	....	10	....	....	2	....	....	2	....	....	....	....	....	....	0	12
New Mexico	15	....	....	1	....	....	....	....	....	....	16	....	....	....	....	....	0	....	....	....	....	....	....	0	16
North Dakota	1	....	....	1	....	....	....	....	....	....	2	....	....	....	....	....	0	....	....	....	....	....	....	0	2
Ohio	103	16	17	4	....	7	....	2	....	....	149	3	....	....	....	....	3	5	....	1	....	2	1	9	161
Oklahoma	11	3	16	....	....	....	....	....	....	1	31	....	....	....	....	2	2	....	....	1	....	1	5	7	40
Oregon	....	....	....	....	....	....	....	....	....	....	0	....	....	....	....	....	0	....	....	....	....	....	....	0	0
Pennsylvania (anthracite)	253	92	20	82	13	3	1	2	....	24	490	19	....	....	....	....	19	[1] 40	....	27	....	....	25	92	601
Pennsylvania (bituminous)	306	107	15	10	....	30	1	5	....	1	475	9	....	....	....	....	9	[1] 28	5	8	3	....	11	55	539
Tennessee	22	3	....	10	....	2	....	....	....	....	37	....	....	....	....	....	0	1	....	....	....	....	....	1	38
Texas	4	1	....	....	....	1	....	....	....	1	7	....	....	....	....	....	0	....	....	....	....	....	....	0	7
Utah	8	2	....	1	....	....	....	1	....	....	12	....	....	....	....	....	0	3	....	....	....	....	....	3	15
Virginia	35	1	10	....	....	3	....	3	....	2	54	....	....	....	....	....	0	1	....	....	....	2	....	3	57
Washington	9	5	18	4	....	3	....	....	....	3	42	....	....	....	....	....	0	....	....	....	....	1	....	1	43
West Virginia	203	51	3	8	....	20	1	4	....	1	291	9	....	....	....	5	14	18	....	1	....	2	3	24	329
Wyoming	25	4	....	8	....	....	....	....	....	....	37	....	....	....	....	....	0	....	....	....	....	....	1	1	38
Total	1,310	375	518	176	14	79	8	18	12	44	2,554	57	2	2	....	14	75	101	5	38	3	12	52	211	2,840
Per cent of total	46.13	13.21	18.24	6.20	0.49	2.78	0.28	0.63	0.42	1.55	89.93	2.01	0.07	0.07	....	0.49	2.64	3.56	0.18	1.34	0.10	0.42	1.83	7.43	100.00

[1] Includes those killed by railway cars.

Number of men killed in and about the coal mines of the United States in the calendar year 1911.

State.	Killed underground.														Killed in shaft.						Killed on the surface.							Total by States.
	By falls of roof (rock or coal).	By falls of coal (other than roof coal).	By mine cars and locomotives.	By gas explosions and burning gas.	By coal-dust explosions.[1]	By "blown-out or windy shots."	By explosives (includes premature blasts, explosion of misfires, suffocation by gases from explosives, by flying pieces from blasts, etc.).	By suffocation from mine gases.	By electricity (shock or burns).	By animals.	By mining machines.	By machines other than locomotives and mining machines.	By mine fires (burned, suffocated, etc.).	By other causes.	Total number killed inside of mines.	By falling down shafts or slopes.	By objects falling down shafts or slopes.	By breaking of cables, chains, etc.	By overwinding.	By other causes.	Total killed by shaft accidents.	By mine cars and mine locomotives.	By electricity (shock or burns).	By machinery.	By boiler explosions.	By railway cars and locomotives.	By other causes.	Total.	
Alabama	46	1	14	2	128	....	5	....	6	....	....	....	....	2	204	1	....	....	....	....	1	....	....	....	....	2	2	4	209
Alaska	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	....	....	....	....	....	0	....	....	....	....	....	....	0	0
Arkansas	9	....	1	....	....	....	....	....	....	....	....	....	....	1	11	....	....	....	....	1	1	....	....	....	....	....	....	0	12
California	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	....	....	....	....	....	0	....	....	....	....	....	....	0	0
Colorado	41	6	12	....	17	1	1	2	2	....	1	....	....	1	84	....	....	....	....	2	2	....	....	....	....	3	....	5	91
Georgia	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	....	....	....	....	....	0	....	....	....	....	....	....	0	0
Idaho	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	....	....	....	....	....	0	....	....	....	....	....	....	0	0
Illinois	70	16	40	1	8	....	13	....	8	1	....	....	....	1	153	8	1	....	....	3	12	1	....	1	....	1	4	7	172
Indiana	17	2	4	1	2	1	10	....	2	....	1	....	....	....	40	3	....	....	....	....	3	1	....	....	....	1	1	3	46
Iowa	22	....	12	....	....	....	....	....	....	....	1	....	....	1	36	2	1	1	....	....	4	....	....	....	....	....	....	0	40
Kansas	20	....	....	....	....	3	3	3	1	....	....	....	....	3	40	1	....	....	....	....	1	....	....	....	1	....	....	1	42
Kentucky	26	1	3	....	1	....	3	....	4	....	1	....	....	2	41	....	....	....	....	....	0	1	....	1	....	2	....	4	45
Maryland	12	....	1	....	....	....	....	....	....	....	....	....	....	1	14	....	....	....	....	....	0	....	....	....	....	1	....	1	19
Michigan	3	1	....	....	....	....	....	....	2	....	....	....	....	1	7	....	....	....	....	....	0	....	....	....	....	....	....	0	5
Missouri	6	1	....	....	....	....	....	....	....	....	....	....	....	....	7	....	....	....	....	....	0	....	....	....	....	1	....	1	7
Montana	7	3	2	....	....	....	1	....	....	....	....	....	....	....	13	....	....	....	....	....	0	....	....	....	....	....	....	0	18
New Mexico	14	2	1	....	....	....	1	....	....	....	....	....	....	....	18	....	....	....	....	....	0	....	....	2	....	1	....	3	23
North Dakota	....	....	....	....	....	....	1	....	....	....	....	....	....	....	1	....	....	....	....	....	0	....	....	....	....	....	....	0	1
Ohio	78	12	12	....	....	....	1	....	3	....	2	....	....	....	108	....	....	....	....	....	0	....	....	....	....	1	....	1	101
Oklahoma	9	....	6	3	....	4	4	....	1	....	....	....	2	....	29	....	....	....	....	4	4	....	....	....	....	....	....	0	33
Oregon	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	0	....	....	....	....	....	....	0	1
Pennsylvania (bituminous)	281	36	95	22	8	....	3	1	35	2	3	1	....	9	496	2	....	....	....	2	4	7	1	3	....	6	12	29	529

[1] These dust explosions may have been started by powder or gas explosions or other causes.

Number of men killed in and about the coal mines of the United States in the calendar year 1911—Continued.

State.	Killed underground.															Killed in shaft.						Killed on the surface.							
	By falls of roof (rock or coal).	By falls of coal (other than roof coal).	By mine cars and locomotives.	By gas explosions and burning gas.	By coal-dust explosions.	By "blown-out or windy shots."	By explosives (includes premature blasts, explosion of misfires, suffocation by gases from explosives, by flying pieces from blasts, etc.).	By suffocation from mine gases.	By electricity (shock or burns).	By animals.	By mining machines.	By machines other than locomotives and mining machines.	By mine fires (burned, suffocated, etc.).	By other causes.	Total number killed inside of mines.	By falling down shafts or slopes.	By objects falling down shafts or slopes.	By breaking of cables, chains, etc.	By overwinding.	By other causes.	Total killed by shaft accidents.	By mine cars and mine locomotives.	By electricity (shock or burns).	By machinery.	By boiler explosions.	By railway cars and locomotives.	By other causes.	Total.	Total by States.
Tennessee	15	....	6	....	84	....	1	....	1	....	....	....	....	1	108	....	....	....	....	....	0	3	1	....	....	1	2	7	115
Texas	5	....	1	....	....	....	2	....	....	....	....	....	....	....	8	....	....	....	....	....	0	....	....	....	....	....	....	0	8
Utah	7	3	2	....	....	....	....	....	....	....	....	....	....	....	12	....	....	....	....	....	0	....	....	....	1	1	....	2	14
Virginia	35	....	18	5	....	....	....	....	2	....	....	....	....	....	60	....	....	....	....	....	0	4	....	....	....	....	4	8	68
Washington	11	....	6	....	....	....	2	1	2	....	....	....	....	....	22	2	....	....	....	....	2	2	....	1	....	....	....	3	27
West Virginia	166	28	58	27	23	....	2	....	20	1	4	....	....	1	330	2	....	....	....	....	2	5	4	2	....	3	4	18	350
Wyoming	18	8	2	1	....	....	1	....	....	....	....	....	....	1	31	....	....	....	....	....	0	1	....	1	....	....	....	2	33
Total (bituminous)	919	120	296	69	271	9	54	7	84	4	13	1	2	25	1,874	21	2	1	0	12	36	27	6	11	2	24	29	99	2,009
Pennsylvania (anthracite)	254	28	97	30	....	....	80	1	3	3	....	1	78	24	599	21	2	2	1	1	27	18	1	22	1	8	34	84	710
Grand total	1,173	148	393	99	271	9	134	8	87	7	13	2	80	49	2,473	42	4	3	1	13	63	45	7	33	3	32	63	183	2,719
Per cent of grand total	43.14	5.44	14.45	3.64	9.97	0.33	4.93	0.29	3.20	0.26	0.48	0.08	2.94	1.80	90.95	1.54	0.15	0.11	0.04	0.48	2.32	1.65	0.26	1.21	0.11	1.18	2.32	6.73	100.00
Per cent of total underground, total shaft, and total surface fatalities	47.43	5.98	15.89	4.00	10.96	0.36	5.42	0.33	3.52	0.28	0.53	0.08	3.24	1.98	100.00	66.67	6.35	4.76	1.59	20.63	100.00	24.59	3.82	18.03	1.64	17.49	34.43	100.00	.....

Production, number of men employed, and number of men killed in and about the coal mines of the United States in the calendar year 1911.

State.	Production (short tons).[1]	Number employed.	Number killed.			Production per death (short tons).
			Total.	Per 1,000 employed.	Per 1,000,000 short tons mined.	
Alabama	15,021,421	22,003	209	9.50	13.91	72,000
Arkansas	2,106,789	5,338	12	2.25	5.70	176,000
California and Alaska	11,647	60	0	0	0	.....
Colorado	10,157,383	14,373	91	6.33	8.96	112,060
Georgia	165,330	510	0	0	0	.....
Idaho	1,821	9	0	0	0	.....
Illinois	53,679,118	75,656	172	2.27	3.20	312,000
Indiana	14,201,355	20,991	46	2.19	3.24	309,000
Iowa	7,331,648	16,852	40	2.37	5.46	183,000
Kansas	6,254,228	11,823	42	3.55	6.72	149,000
Kentucky	13,706,839	24,124	45	1.87	3.28	305,000
Maryland	4,685,795	6,079	15	2.47	3.20	312,000
Michigan	1,476,074	3,248	7	2.16	4.74	211,000
Missouri	3,760,607	9,607	8	8.33	2.13	470,000
Montana	2,976,358	3,864	13	3.36	4.37	229,000
New Mexico	3,148,158	3,706	21	5.68	6.67	150,000
North Dakota	502,628	760	1	1.32	1.99	503,000
Ohio	30,759,986	45,459	109	2.40	3.54	282,000
Oklahoma	3,074,242	8,729	33	3.78	10.74	93,000
Oregon	46,661	304	1	3.29	21.28	47,000
Pennsylvania (anthracite)	90,464,067	173,940	710	4.08	7.85	127,000
Pennsylvania (bituminous)	144,754,163	171,108	529	3.09	3.65	274,000
Tennessee	6,433,156	11,124	115	10.34	17.88	56,000
Texas	1,974,593	4,980	8	1.61	4.05	247,000
Utah	2,513,175	3,446	14	4.06	5.57	180,000
Virginia	6,864,067	8,107	68	8.39	9.91	101,000
Washington	3,572,815	7,236	27	3.73	7.56	132,000
West Virginia	59,831,580	66,800	350	5.24	5.85	171,000
Wyoming	6,744,864	8,118	33	4.07	4.89	204,000
Total	496,221,168	728,348	2,719	.....	.....	.....
Average	.....	.....	.....	3.73	5.48	183,000

[1] Kindly furnished by E. W. Parker in advance of publication in Mineral Resources, U. S., 1911: U. S. Geol. Survey.

INJURIES CAUSED BY ELECTRICITY.

Sir Thomas Oliver, M. D., Newcastle-on-Tyne, England.

The increasing use to which electricity is put has opened up new sources of danger to life, but more accurate knowledge of the generation and distribution of electrical currents will enable man to anticipate these dangers and to obviate them. Hardly a week passes without the public being reminded through the daily press of the deadly effects of electricity, whether employed for illuminating purposes, as a transporting agent, or in bringing about decomposition and reconstruction of chemical compounds, thereby inaugurating new processes of manufacture, and to which the prosperity of modern chemical industry is largely due. The subtle fluid will forever remain a source of danger to the unwary. The effects of powerful currents resemble lightning stroke, with the difference that, while death in lightning stroke is direct, and is due to destruction or alteration of the tissues, death in electric shock is the result of

effects produced upon the heart, respiration, and the nervous system. Contact with a live wire or an unprotected piece of machinery may kill a person outright. If not killed immediately, the man may be so severely injured that he dies a few days afterwards, or he is extensively burned and recovers slowly, with perhaps loss of part of a limb. Death may be immediate without any noticeable change on the surface of the body; usually, however, there are marks of burning or other external signs indicative of the penetration and exit of the current. When a workman has grasped live metal, he may be unable to relax his grip, or his body is thrown forward a short distance, as if impelled by some titanic force.

We do not know what pressure of electrical current exactly comes within the limits of safety. In the remarks which follow, by the term "voltage" is meant pressure, tension, or electromotive force, and by "milliampérage," the intensity of electrical current. In comparing an electrical current with a stream of water falling from a great height, voltage or tension would be represented by the height of the waterfall, and intensity by the section of the stream. Of the two kinds of currents, the alternating is more dangerous than the continuous. Tesla and D'Arsonval are, however, of opinion that while alternating currents of low tension may be dangerous, they become less dangerous when their value is higher. Electrical currents with an intensity of 20 milliampères will cause pain, but Kammerer[1] states that a milliampèrage of 50 to 60 will cause serious harm, and that 100 will be probably fatal. As regards the harmful effects produced by electricity, the current is usually spoken of in terms of voltage, so that when a fatal accident has occurred the question is generally asked with what voltage was the wire or metal charged at the time of the accident? We can not always say what voltages are safe, for there are several circumstances in operation at the time of the accident to modify the action of the electrical current. One man was killed near Prague through contact with a wire charged with a pressure of 95 volts, and yet electricians can touch wires carrying currents of such high tension as 5,000 volts without experiencing any ill effects. Jellinek maintains that the tension of an electrical current is the first point to be determined in our consideration as to whether a current is to be regarded as dangerous or not. Although a current of 100 to 150 volts is usually regarded as within the limits of safety, 200 to 300, as coming within the danger sphere, and anything above 600, as likely to be fatal, there is no absolute certainty in this statement.

When framing regulations, it was the opinion of the dangerous trades committee of the British Home Office that currents of 700 volts direct and 350 alternating should be regarded as dangerous. On the other hand, while the Board of Trade makes no distinction

as to what are safe and unsafe voltages, 250 volts is the maximum it allows electricity supply undertakers to take into private consumers' premises. In the United States, the voltage recommended for the electrocution of criminals is 1,500, but contact with even such a high voltage has not always caused immediate death, for the heart of the electrocuted person has commenced to beat again, and respiration to be restarted, so that fresh electrical contact had to be made. Mode of contact and duration of application are important factors, for the longer the application of the current, the greater is the danger, owing to the resistance of the skin becoming diminished. When, after a severe shock, unconsciousness does not supervene, fear may cause the injured workman to faint. Contact with both poles is more dangerous than contact with one pole alone, since a more effective circuit is formed. The skin offers most resistance to the passage of electrical currents. The resistance is measured in terms of ohms. Much depends upon the condition of the skin at the time of contact, viz, whether it is dry or moist. The hard, thickened, and dry skin of a workman's hand is less favorable to the penetration of an electrical current than where the skin is delicate and moist. Resistance to current occurs mainly at the point of penetration in the skin and the point of exit, for the resistance offered by the deeper tissues is slight. With few exceptions, the point of exit from the body for the current is the feet. As contact is for the most part unipolar, and is generally made by the hands or arms of a workman, the current, after traversing the body, escapes to earth by the feet, so that the condition of the boots of the workman at the time of the accident and the condition of the soil upon which he is standing, viz, wet or dry, will determine whether an electrical current prove fatal or not.

Alternating currents are almost twice as dangerous as continuous. There is a difference in their action. Continuous currents at high tension cause severe burning and great local destruction of tissue, but, with alternating currents, although burns appear, there is less burning and less local destruction of tissue. It is characteristic of the burns caused by electricity that they are red, angry looking, painful, slow to heal, and that they extend deeply into the tissues, exposing bone. When an electrical current penetrates the skin, none of its energy is lost; it is simply transformed into mechanical, thermal, chemical, and electrolytic action. While the effects produced are the result of the combined influence of all of these, they are, for the most part, of a thermal and electrolytical nature.[2] The heat which is generated, and which is an accompaniment of the tetanic rigidity of the muscles, is considerable. Decomposition of the tissues caused by electrolysis is none the less a noticeable feature. The ions formed under these circumstances possess chemical affinities, whereby new compounds born of tissue decomposition are formed. It is pos-

sible that it is to the operation of these toxins that many of the pathological effects produced by electrical currents are due. It is thus that the burns caused by electricity differ from those produced by other means. The skin at the point of penetration undergoes changes of texture and color consequent upon excessive heat, the deeper tissues may be charred, torn, or completely removed, and yet these local injuries can hardly be altogether regarded as burns, since, unlike burns, they are not altogether due to extension from the surface, but to intense internal heat.

I repeat, the effects produced by electrical currents upon the body depend largely upon the manner in which the currents enter. Good contact, a moist skin, and damp boots will transform an electrical current which would probably have been regarded simply as hazardous into one of a fatal character. Men working on electrified railways ought therefore to remember that the danger is greatest in wet weather. The danger consists in one foot touching a live rail, while the other foot is on the wet earth. The periods of danger are the making and breaking of electrical contacts, for, as the current continues to pass, the resistance of the body is diminished. During the electrocution of the criminal MacElwan, in the United States, the resistance fell from 800 to 516 ohms in a little less than one minute, and a few seconds after, when another current had been passed, it was found that the resistance had fallen to 214 ohms.

I shall briefly mention three cases of severe electrical injuries which came under my own observation, one of which terminated fatally. One wet day, a man accidentally placed his foot on a live rail, and was immediately thrown down. He was rescued by a signal man, wearing India-rubber gloves. When seen by Dr. Alfred Wilson, of Wallsend, with whom I saw the patient in consultation, the man was the subject of recurrent convulsions and was unconscious. He remained unconscious for several hours. Although his boots and clothing were untouched, yet, on removing his boots, the feet were found to be the seat of angry-looking sores on the heel, and the bone was exposed. The burns were slow in healing. There was no return of the nervous symptoms, and the man made a good recovery.

The second case is that of a youth of 18, who was admitted into the Royal Victoria Infirmary under the care of my surgical colleague, Mr. Angus, who has kindly allowed me the use of his notes. This youth, while standing on a concrete floor, touched a wire carrying 6,000 volts alternating current with his right hand, and received a severe shock. The palmar aspect of the right hand was deeply charred, so, too, but to a less degree, the plantar surface of the right toes. The skin beneath the left toes was only slightly burned. Later on the burnt tissues of the right hand sloughed and the flexor tendons were exposed. In consequence of gangrene set-

ting in, several of the phalanges had to be amputated, and upon the palmar aspect of the hand a large graft of skin was successfully applied.

The third case was that of a man of 22, a laborer, who was admitted into the Royal Victoria Infirmary, Newcastle-upon-Tyne, in a state of unconsciousness. He had, when working at a power station, received an electric shock from a current of 20,000 volts. I saw him with Dr. E. L. Markham, one of the house surgeons, about 2½ hours after the accident. There were several large burns on the shoulders, abdomen, and limbs, also a deep wound on the back of the head, exposing the occipital bone. The pulse was rapid—about 150 to the minute. The heart's sounds were feeble; the pupils were dilated, corneal reflexes were present, and there was profuse perspiration. Shortly afterwards, Cheyne-Stokes respiration developed. Within 7 hours after his admission into the infirmary, the patient died, never having regained consciousness.

At the post-mortem examination, in addition to the large superficial burns, there were found, on removing the calvarium, acute inflammatory changes in the diploe of the right occipital bone, immediately underlying the superficial burn. On section of the brain, a hemorrhage about the size of a walnut was found in the substance of the occipital lobe corresponding to the wound on the surface. The hemorrhage in the brain was surrounded by softened tissue and by numerous petechial hemorrhages in the white matter. Nearly all the internal organs were congested. The bladder was full of blood-stained urine, free from sugar. Portions of brain were submitted to Dr. Frederick W. Mott and Dr. Schuster for examination. These gentlemen reported that, in addition to naked-eye hemorrhages, there were found, on microscopical examination, others due to ruptured vessels, both in the cortex and the subjacent white matter of the brain. The blood in places showed evidence of haemolysis. All the ganglion cells of the cortex showed chromolytic changes. Not one cell could be seen exhibiting the normal Nissl pattern. The large and small cells of the medulla oblongata also showed marked chromolytic changes.[3]

When a person receives a fatal electric shock there is usually heard a cry. This attracts the attention of fellow workmen who may be at hand, and by it they are directed to the spot where is lying the apparently lifeless body of their comrade. The face of the injured is pale or cyanosed. The heart is no longer beating, the pupils are dilated, and mucus is perhaps oozing from mouth and nose. The hand may still be grasping the live metal, or, if contact has been broken, the body may have been thrown forward several feet from the site of the accident.

In conjunction with my colleague, Prof. Robert A. Bolam, I carried out a series of experiments with the view of determining the cause of death in electric shock. We employed continuous currents. In most of the animals death was due to sudden arrest of the heart's action. If the contact is good, high electrical currents throw the body of an animal into a condition of extreme rigidity, as in opisthotonos. On breaking the current, respiration becomes quicker and deeper, and the heart gradually returns to its normal beat. In the case of one dog apparently killed by an electrical current, the heart having ceased to beat, the animal yet barked for fully a minute; but, notwithstanding this fact, the beat of the heart was not again restored. Before commencing these experiments I had been under the impression that in death in electric shock the respiration would be the first affected, but our experiments indicated that with electrical pressures of 250 volts death came from the heart, and that with higher voltages heart and respiration ceased simultaneously. That death came from the heart and not from the medulla oblongata was shown by the fact that when the pneumogastric nerves were divided the result was in no way affected.

MM. Prévost and Batelli, of Geneva, carried out similar experiments. They found that currents of low tension cause death by the heart becoming paralyzed. This organ is thrown into fibrillary tremor. With currents of higher tension the animal is killed outright by arrest of the breathing through inhibition of the respiratory center. With alternating currents of low tension, e. g., 120 volts, Prévost and Batelli found that the heart is the first organ attacked and that with high voltages, e. g., 1,200 to 4,800, respiration is arrested through inhibition of the respiratory center. It would appear, therefore, as if the effects of continuous current of low voltage are mainly observed on the heart. Fifty volts is sufficient to induce fibrillary tremor of the heart. In employing alternating currents of 550 volts, Prévost and Batelli found that the heart was suddenly arrested, and that after suspended respiration for several seconds breathing would recommence, continue for a short time, and then gradually become feebler and feebler, until death ended the scene. Grange [4] considers that death comes through cardiac and respiratory failure, owing to hemorrhages into the medulla oblongata pressing upon the origin of the pneumogastric nerves. Jellinek found on lumbar puncture evidence of high cerebrospinal pressure in death following electric shock. This observer is of the opinion that death is the outcome of two factors, psychical and anatomical, and that the anatomical plays the more important part. In Jellinek's experiments death was mostly due to cardiac arrest, but in other experiments heart and respiration ceased together, while in still others

death came through the respiratory center. Kammerer [5] gives a short list of fatalities caused by low voltages:

At Prague, a man working in a potassium factory, 95 volts, 1 death.
At Oscherleben, men working in a sugar factory, 230 volts, 4 deaths.
At Fulham Baths, 200 volts, 2 deaths.
At Vieux Thann, a foundry, 220 volts, 1 death.
At Cannaux, mines, 240 volts, 1 death.

To which may be added: [6]

At Ivry Station (1904), 200 to 400 volts, 2 deaths.
At Puteaux (1909), owing to the short circuiting of a lamp in a kitchen, 110 volts, 1 death.

LOCAL EFFECTS—BURNS, CONJUNCTIVITIS.

Exposure to strong electric light may be followed by erythema of the skin, resembling that produced by the intense rays of the sun. The burns caused by electrical currents are red and angry looking. They heal slowly, owing to the peculiar effect produced by the current upon the cells of the tissue and the destruction of nerve fibers.

In consequence of exposure to powerful electrical illumination vision may be temporarily lost, or conjuctivitis may develop. If the eyes have been brought into close contact with the light there may be, in addition to conjunctivitis, myosis and slight opacities on the cornea or minute erosions of it. There may be photophobia and excessive lachrymal secretion. Electric sparking is a source of danger to the eyes. The skin, eyebrows, and eyelashes may be burned and the conjunctiva becomes hyperaemic. The inflammation is followed by a muco-purulent secretion. The iris and retina may suffer and vision be rendered defective for a considerable length of time. After recovery has taken place persistent neuralgia is apt to remain.

The treatment of electrical injuries is local and general. Into the treatment of local injuries, such as burns, I do not propose to enter. General treatment is preventive and curative. To all persons working in electricity the danger of the occupation should be pointed out, and only intelligent men employed. It is the unskilled laborers who so frequently get caught. When a person has received a severe electrical shock the first thing a rescuer has to do is to sever the contact by cutting the wire, care being taken to protect the hands by dry cloths. The greatest care must be exercised in removing the body from contact with the live metal, and especially so if the workman's clothes are damp. These should be grasped only if they are dry. India-rubber gloves are the best protectives. Since every moment is of importance, and gloves may not be immediately procurable, rescuers ought to wrap their hands with thick dry rags before attempting to pull away the apparently lifeless body of a fellow

workman. Placing the body on its back, and sending for medical assistance, the men should at once resort to artificial respiration, and continue it for a long time, imitating, as far as possible, the natural movements of respiration, viz, at the rate of about 16 to the minute. By means of artificial respiration continued for half an hour to an hour, many lives apparently brought to a close by electric shock have been restored.

[1] Bulletin de la Société Industrielle de Mulhouse, juin–juillet, 1904.

[2] Jellinek, Bulletin de la Société Industrielle de Mulhouse, juin-julliet 1904.

[3] Treatment of Injuries coused by Electricity, Sir Thomas Oliver, Lancet, Feb. 11, 1911, p. 363.

[4] Lancet, Aug. 20, 1904.

[5] Bulletin de la Société Industrielle de Mulhouse.

[6] Report "d'une commission chargée d'élaborer le texte de l'instruction sur les premiers soins à donner aux victimes des accidents électriques; p. 67, Paris, Déc., 1910."

DISEASES AND INJURIES OCCURRING IN ELECTRIC GENERATING PLANTS.

Dr. J. D. McGowan, Chicago, Ill.

The facts set forth in this paper are obtained through a service of 13 years as surgeon with the Commonwealth Edison Co. and 10 years with the Chicago Telephone Co. In the former organization semiannual inspections of all employees are held for the purpose, eliminating all who may be suffering from disease and providing them with occupations or placing them in an environment conducive to their recovery. All new applicants for positions are examined physically before being assigned to permanent employment.

By this method we have discovered many cases of tuberculosis, the victims of which disease are given situations in the Western States particularly suited to their cases, which enables them to prolong their lives and diminish their discomfort, at the same time removing them from contact with their fellow employees and thus preventing the spread of the disease throughout the organization.

These cases of tubercular disease have come from all departments of the company, and are more numerous in the generating stations. The men employed in the electrical construction, interior and aerial, are a particularly robust set of individuals, and are seldom ill.

In same instances the substations are in basements or sub-basements where the temperature ranges very high, in some cases considerably over 100° F., and the air is not strictly pure. These basements are not generating stations, but plants equipped with rotary converters, where the current is received at a high voltage and distributed to the consumers at about 110 volts. Close confinement in these base-

ments, breathing impure air, and enervation by the intense heat has caused some of the men to break down, and we have found it necessary to give them work in the open air in order to bring them back to a normal condition of health.

The cases of tubercular disease in the generating plants are found largely among the machinists, and are probably helped along by the high temperatures and by particles of dust inhaled by the workmen. We have had two cases of tuberculosis in firemen, and the same conditions of heat and dust doubtless contributed to their physical breakdown.

Among the injuries sustained we have the usual fractures and dislocations of bones, wounds and contusions of all kinds, sprains, nail punctures, and other injuries such as are met with in men and women engaged in any hazardous occupation. Peculiar to the electrician are accidents such as burns, shocks, and infections from copper wire. We have had some very severe cases of infection from punctures or scratch by copper wire. This metal appears to be particularly poisonous when it penetrates the epithelium, and some virulent cases of cellulitis have resulted from mere abrasions received in striking the wire.

Shocks are common; severe shocks causing deaths are now rare in comparison to what they were 10 years ago, owing to the various safety devices, the greater care in supervision, and greater caution on the part of the employee. In the Chicago Telephone Co., in one year, there were 473 cases of shock reported, two of which resulted in death. In the Commonwealth Edison Co. no exact record has been kept. Of burns, we have all varieties—the steam burn, second degree; the burn by hot insulating compound, usually second degree; the flash burn from short-circuiting a wire, second degree. The dazzling arc formed by the short circuit nearly always affects the eyes, causing a severe conjunctivitis, which may not be felt until several hours after the burn on the hands or face has been received. Occasionally the cornea is burned.

The contact burn is received by the fingers or any part of the body touching a live wire, brass-bar switch, or any piece of metal charged with the electric current. The severity of the burn depends on the amount of current, or the length of time in contact, or whether the contact is perfect. A perfect contact with a good " ground " from a wire carrying anywhere from 350 volts upwards will often cause death. I believe that some men escape death on account of being in perfect physical condition, whereas some who may have some organic disease of the heart or kidneys will succumb to a much lighter voltage than that from which others escape.

The contact burn is sometimes very severe, resulting at times in the loss of one of the extremities. We have had two cases where

amputation of the arm was necessary, one case of amputation of the leg, and many cases of amputation of fingers and the whole hand. The current, by its electrolytic action on the blood, causes a necrosis of the tissues and bones by destroying the blood supply to the parts where the current penetrates and where it makes its exit from the body.

The popular impression, shared with the laity by many physicians, that contact with the electric current causes paralysis and brain lesions is an entirely erroneous one. I have seen a hundred cases of shock, and, where the individual did not meet immediate death, there has never been one case in which the patient suffered in any way outside of the local effect of the burns, which may result in loss of a member or a bad scar. One man, whose head came in contact with live wire, received a burn, in the healing of which the outer table of the skull for a space of 2 inches long and one-half inch wide sloughed away, and he has been at work steadily for over two years, apparently in better condition than before his injury. In many instances we have had men receive severe shocks and burns who, after recovery, have put on weight and have appeared stronger physically than before the shock.

Women are more sensitive to the electric current than men, and girls working on telephone switchboards sometimes become quite hysterical after a slight shock from a low voltage.

DIE UNFÄLLE UND ERKRANKUNGEN DER EISENARBEITER.

Prof. Dr. FRIEDRICH RÖPKE in Solingen.

A. UNFÄLLE.

In wie hohem Grade die Eisenarbeiter Betriebsunfällen ausgesetzt sind, geht aus einer Zusammenstellung Saegers über das Jahr 1891 hervor: In diesem Jahre betrug die Zahl der Versicherten bei den 8 Deutschen Eisen- und Stahl-Berufsgenossenschaften 11.69 Prozent, 1/9 der bei sämtlichen 64 gewerblichen Berufsgenossenschaften Versicherten. Dagegen war der Prozentsatz der entschädigungspflichtigen Unfälle 16.16, 1/6, und der überhaupt angemeldeten Unfälle gar 24.9, oder 1/4.

Unter den Eisenarbeitern sind nun wieder die Arbeiter der Grosseisenindustrie (Hüttenbetriebe, Walz- und Hammerwerke), in viel höherem Grade Unfällen ausgesetzt, als die Arbeiter der Kleineisenindustrie. Auch sind die Unfälle bei den Arbeitern der ersten Gruppe durchschnittlich schwerer, wie ohne weiteres aus der Gegenüberstellung der auf Tabelle 1 befindlichen statistischen Angaben hervorgeht.

Die Unfälle der Eisenarbeiter bestehen zum grössten Teile in mechanischen Verletzungen, nur ein kleiner Bruchteil entsteht durch Verbrennung oder Verbrühung.

Wenn wir den Unfallsursachen in den einzelnen Betrieben näher nachgehen, so stossen wir bei den Hochofenarbeitern zunächst auf Explosionsverletzungen. Die Explosionen ereignen sich bei Eintritt von Luft in die Gasleitungen oder auch bei Berührung des flüssigen Eisens mit Wasser. Gelegenheit zu Verbrennungen bietet sich bei den Hochofenarbeitern auf der Gicht, vor der Abstichöffnung und beim Transportieren der glühenden Schlacken. Unfällen durch Gasvergiftung sind diese Arbeiter auf der Gicht, bei Undichtigkeiten oder bei Reinigungsarbeiten der Gasleitung ausgesetzt.

In den Eisengiessereien und Gussstahlwerken bestehen grosse Unfallgefahren beim Transportieren und Ausgiessen des flüssigen Metalls, wie auch beim Transportieren oder Verladen der fertigen Produkte. In Stahlwerken kommen bei dem Bessemer-Verfahren oft Verbrennungen durch Funkenregen aus den Convertern vor. Arbeiter an den Martinöfen sind Explosionsgefahren bei der In- und Ausserbetriebsetzung der Öfen ausgesetzt. In den Gussputzereien und Schleifereien können die Arbeiter durch abspringende glühende Metallteile beim Putzen an der Schmirgelscheibe oder beim Schleifen verletzt werden, auch kommen Unfälle durch Zerspringen von Schmirgel- oder Schleifsteinen vor. Walzwerkarbeiter laufen leicht Gefahr, von den austretenden glühenden Stäben gestreift oder gespiesst zu werden. Die Arbeiter in Hammerwerken erleiden oft Betriebsunfälle durch abspringende Metallteile, ab und zu auch durch unerwartetes Herabfallen des Hammerbären.

B. ERKRANKUNGEN.

ALLGEMEINE STATISTIK.

Dasselbe Bild, wie bei den Unfällen, haben wir wieder bei den Erkrankungen der Eisenarbeiter. Der Prozentsatz der Erkrankten ist bei den Arbeitern der Grosseisenindustrie erheblich grösser als in der Kleineisenindustrie. Zum Beweis dafür bringe ich die Morbiditätsstatistiken von je drei Werken der beiden Gruppen.

Auf 100 Arbeiter kamen Erkrankte in den Jahren 1903, 1904, und 1905:

GROSSEISENINDUSTRIE.

1. Deutsch-Österreichische Mannesmannröhrenwerke in Düsseldorf: 74.8, 81.7, 80.3.
2. Siegen-Solinger Gussstahlaktienverein in Solingen: 71.7, 59.2, 47.6.
3. Düsseldorfer Röhren- und Eisenwalzerke: 69.4, 84.4, 85.1.

KLEINEISENINDUSTRIE.

1. Firma I. A. Henckels in Solingen (Fabrik feiner Schneidewaren): 34.9, 40.6, 40.4.

2. Firma Weyersberg, Kirschbaum & Co. in Solingen (Fabrik für blanke Waffen und Fahrradteile): 33.8, 26.5, 30.2.

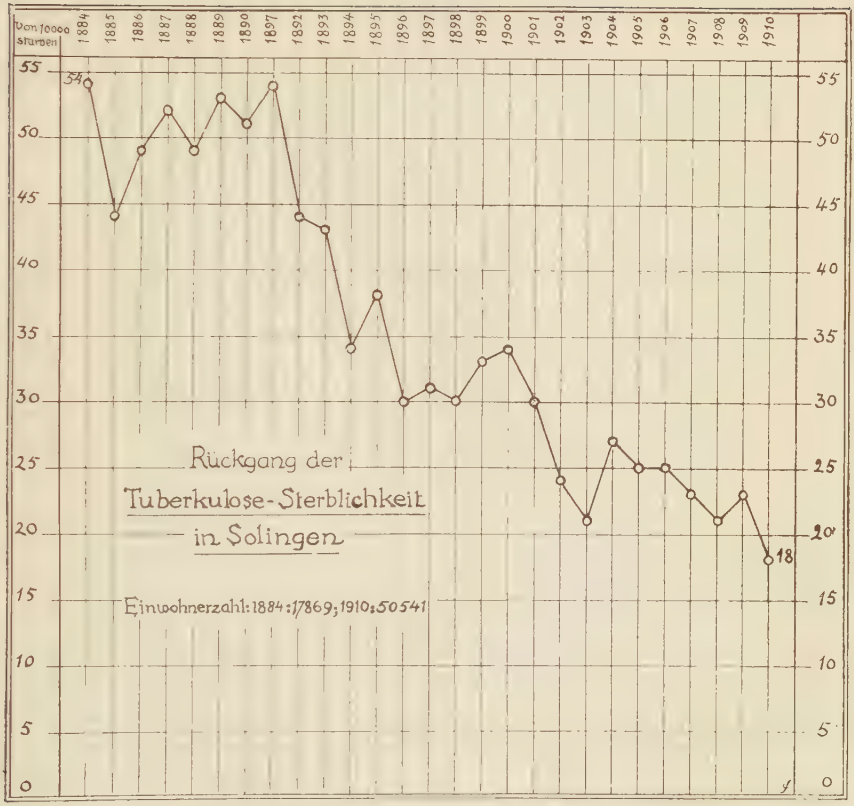
3. Firma Kortenbach & Rauh in Ohligs (Fabrik für Schirmfournituren): 22.6, 30.6, 30.9.

Unter den Arbeitern der Kleineisenindustrie nötigen uns nun ein ganz besonderes Interesse die Schleifer ab, deren Gesundheitsverhältnisse früher in allen Ländern trostlos waren. Über die Gesundheitsverhältnisse der französischen Schleifer sind mir keine neueren Untersuchungen bekannt. Da aber in Frankreich keine durchgreifende Sanierung der Arbeitsstätten stattgefunden hat, so gehen wir wohl nicht fehl, wenn wir annehmen, dass die Schleifer dort noch sehr ungünstige Gesundheitsverhältnisse aufweisen. Dass die Mortalität der amerikanischen Schleifer erschreckend gross ist, hat unter anderem James H. Lloyd im Jahre 1895 festgestellt. Die neuesten Untersuchungen über die Gesundheitsverhältnisse der englischen Metallschleifer hat der Medical Officer of Health für Sheffield, Dr. Scurfield angestellt. Nach ihm starben in den Jahren 1901–1909 von 1,000 lebenden Schleifern über 18 Jahre durchschnittlich jährlich 30.6, während von 1,000 Lebenden der ganzen männlichen Bevölkerung Sheffields über 20 Jahre in derselben Zeit nur 16.4 starben.

Der älteste deutsche Autor, der die Gesundheitsverhältnisse der Metallschleifer studiert hat, ist Oldendorff. Seine statistischen Erhebungen betreffen die Schleifer Solingens und erstrecken sich auf die Jahre 1850–1874. Die Mortalität der Schleifer über 20 Jahre betrug in dieser Zeit 25 pro Mille, während die Mortalität der übrigen männlichen Bevölkerung Solingens über 20 Jahre nur 12.6 pro Mille betrug.

Weitere Erhebungen über die Gesundheitsverhältnisse der Schleifer desselben Bezirkes verdanken wir Dönhoff. Seiner Statistik liegen die Sterbeziffern der Jahre 1885–1895 zu Grunde. Von 1.000 lebenden Schleifern starben 20.62, von 1,000 Lebenden der übrigen männlichen Bevölkerung Solingens nur 13.6 durchschnittlich jährlich. Auf die einzelnen Lebensalter verteilt ergab sich folgendes Resultat. Es starben von 1,000 Lebenden durchschnittlich im Alter von Jahren:

	14–20.	21–30.	31–40.	41–50.	Über 50.	Summa.
Schleifer	1.16	3.84	5.14	5.5	4.6	20.62
Übrige männliche Bevölkerung	1.0	1.5	1.7	2.5	7.1	13.6


Von 10000 starben
1884
1885
1886
1887
1888
1889
1890
1891
1892
1893
1894
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904
1905
1906
1907
1908
1909
1910
55
50
45
40
35
30
25
20
15
10
5
0
54
18
Rückgang der
Tuberkulose-Sterblichkeit
in Solingen
Einwohnerzahl: 1884: 17869; 1910: 50541

Im Jahre 1898 haben dann Moritz und ich weitere eingehende Untersuchungen über Morbidität und Mortalität der Solinger Schleifer gemacht: Wir fanden unter den 1,250 von uns untersuchten Vollständig Gesunde, 200, 16 Prozent; subjektiv Kranke, 71, 5.7 Prozent; objektiv Kranke, 979, 78.3 Prozent.

In der Altersstufe über 45 Jahre fand sich kein vollständig Gesunder mehr. Wesentlich günstiger boten sich die Verhältnisse schon in den Jahren 1904–5 dar: In diesen beiden Jahren starben von 1,000 lebenden Schleifern durchschnittlich 10.95. Von den über 20 Jahre alt verstorbenen Schleifern der Jahre 1904–5 standen im Alter bis zu 50 Jahren 76.51 Prozent, über 50 Jahre, 23.49 Prozent, gegen 81.9 Prozent und 18.1 Prozent der Oldendorff'schen Statistik aus den Jahren 1850–1874.

Im vorigen Jahre hat der Gewerbeinspektor in Solingen Dr. Kuhlmann für die Dresdner Internationale Hygiene-Ausstellung die Mortalität der Schleifer für die Jahre 1909–10 feststellen lassen; das Ergebnis war ein weiteres Sinken und zwar auf 9.3 pro Mille. (Vergleiche Tabelle 2 in der Anlage.)

Die Besserung der Gesundheitsverhältnisse der Solinger Schleifer drückt sich nun ferner in den folgenden Morbiditätsziffern aus: Bei der Ortskrankenkasse für Schleifer in Höhscheid bei Solingen erkrankten mit Arbeitsunfähigkeit 1886–1898 38.5 Prozent der Versicherten, dagegen 1902–1904 nur 22.6 Prozent.

AETIOLOGIE DER ERKRANKUNGEN.

A. GROSSEISENINDUSTRIE.

Als Berufsschädlichkeiten der Arbeiter der Grosseisenindustrie kommen hauptsächlich in Betracht:

(1) *Schädigungen, welche die Luftverunreinigung durch Gase, Dämpfe und Staub verursacht.*—Die Zusammensetzung und Menge der Gase ist nach den jeweiligen Bestandteilen der Eisenerze und nach dem Orte der Entstehung verschieden. Giftige Gase entweichen in den Hochöfenbetrieben aus der Gicht, aus dem Schlackenlauf und aus der Abstichöffnung. Sie haben einen hohen Prozentsatz an Kohlenoxyd, schwefliger Säure, Cyanverbindungen, und falls das Eisenerz bleiglanzhaltig ist, auch an Bleidämpfen.

In den Eisengiessereien und Gussstahlwerken sind die Schmelzer und Giesser durch die kohlenoxydhaltigen Gase der Oefen gefährdet, namentlich, wenn die Abzüge mangelhaft sind. Ferner atmen die Gasstocher grosse Mengen kohlenoxydhaltiger Gase ein. Die Former haben beim Formen selbst nur mit feinstem Material zu tun, dagegen leiden sie beim Einstäuben der fertigen Formen mit Kohlenpulver, Graphitstaub und dergl. und beim späteren Zerschlagen der noch

heissen Formen unter Staub und Dämpfen. Hat der Former die Gussstücke von dem gröbsten Staub befreit, so kommen diese in die Hände des Gussputzers, der mit dem Meissel oder vermittelst des Sandstrahlgebläses die Putzarbeiten macht. Der feinere Putz wird vielfach auf trockenen Schmirgelsteinen hergestellt. Bei allen diesen Arbeiten wird Sand-, Metall- und Schmirgelstaub in reichlicher Menge aufgewirbelt.

(2) *Schädlichkeiten, welche durch die Schwere der Arbeit, durch häufigen jähen Temperaturwechsel, durch grelles Licht und durch die Fabrikgeräusche hervorgerufen werden.*—Die Arbeiten in der Hütten- und Grosseisenindustrie erfordern durchschnittlich ein grosses Mass von Körperkraft. Das Transportieren der Rohmaterialien, der halbfertigen und fertigen Produkte, das Hantieren mit den schweren Teilen während der verschiedenen Fabrikationsphasen bedingen eine ausserordentlich angestrengte Muskeltätigkeit. Die stets sich wiederholenden erheblichen Körperanstrengungen rufen naturgemäss leichtere oder schwerere Gesundheitsstörungen hervor. Während die Transportarbeiter ihre Beschäftigung sehr oft im Freien haben, dabei allerdings den Unbilden der Witterung ausgesetzt sind, leiden die eigentlichen Innenarbeiter noch mehr oder weniger unter der Gluthitze, welche den Oefen, dem flüssigen Metall oder den zu bearbeitenden glühenden Metallmassen entströmt. Setzen sich diese in Schweiss gebadeten Arbeiter Zugluft aus, oder treten sie unvermittelt, ohne den bei der Arbeit meistens nur halbbedeckten Körper bedeckt zu haben, an die frische Luft, so ziehen sie sich leicht Erkältungskrankheiten jeglicher Art zu. Ein weiterer, nicht zu unterschätzender Nachteil für die Gesundheit erwächst den Arbeitern aus der leider in der Mehrzahl dieser Betriebe nötigen Nachtarbeit. Die Arbeiter, welche in das grelle Licht der Oefen sehen müssen, erleiden ebenso wie die beim elektrischen Schweissverfahren beschäftigten Arbeiter Schädigungen seitens der Augen. Störungen des Gehörs treten auf die Dauer bei allen den Arbeitern auf, welche starken Fabrikgeräuschen ausgesetzt sind.

B. KLEINEISENINDUSTRIE.

Wir können bei der Kürze der zur Verfügung stehenden Zeit nur den Berufsschädigungen bei den folgenden vier Hauptgruppen nachgehen: 1. Schmiede; 2. Schlosser; 3. Feilenhauer; 4. Schleifer und Polierer.

1. *Schmiede.*—Sie haben unter dem Kohlenstaub und Kohlendunst des Schmiedefeuers zu leiden, namentlich, wenn die Werkstatt klein und schlecht ventiliert ist. Auch jähem Temperaturwechsel haben sie sich vielfach auszusetzen. Das lange Stehen und die durchschnittlich schweren Arbeitsverrichtungen bedingen häufig eine

Überanstrengung einzelner Muskelgruppen, sowie des ganzen Körpers.

2. *Schlosser.*—Bei den hauptsächlichsten Arbeitsverrichtungen dieser Gruppe, dem Zurichten, dem Feilen, dem Drehen, Bohren und Montieren des Arbeitsstücks wird so wenig Staub aufgewirbelt, dass nach dieser Richtung hin von Berufsschädigung kaum die Rede sein kann. Eine Ausnahme bilden die Arbeiten an der Schmirgelscheibe. Dagegen ist die vornübergebeugte Haltung, welche die Feiler und Dreher vielfach einnehmen, nachteilig für die Gesundheit. Die Schlosser haben auch in manchen Betrieben sehr unter den Fabrikgeräuschen zu leiden.

3. *Feilenhauer.*—Als gesundheitsschädigende Faktoren konmen in Betracht: Die Schwere der Arbeit, die Körperhaltung bei der Arbeit. Der Körper des Feilenhauers ist bei der Arbeit dicht über den Amboss gebeugt, sodass die Brust vollständig eingedrückt ist. Seine Arme sind in angestrengtester Tätigkeit, da er mit einem schweren Hammer schnell hintereinander Schläge gegen den auf die zu behauende Feile gesetzten Meissel auszuführen hat. Dagegen sind seine Füsse festgestellt, sie ziehen den Riemen an, durch den die Feile auf dem Amboss festgehalten wird.

4. *Schleifer und Polierer.*—Die hauptsächlichsten Gesundheitsschädlichkeiten sind (1) die Körperhaltung des Schleifers während der Arbeit; (2) der bei der Arbeit aufgewirbelte Stein- und Stahlstaub; (3) die Durchnässungen. Der deutsche Schleifer sitzt starkgebeugt auf einem Schemel, stemmt die Ellenbogen auf die Kniee und drückt mit vorgestreckter Hand den zu schleifenden Gegenstand gegen den Stein oder die Scheibe, welche auf ihn zu rotieren. Durch die gebückte Haltung, welche der Schleifer bei der Arbeit einnimmt, wird der Brustkorb zusammengedrückt. Der englische Schleifer hat eine Methode zu schleifen, welche nicht so gesundheitsschädlich ist. Er sitzt leicht gebeugt hinter und über dem Stein und presst mit ausgestreckten Armen den zu schleifenden Gegenstand gegen den Stein, der von ihm ab rotiert.

Arbeitet der deutsche Schleifer an trockenen Steinen, so fliegt ihm, da das Gesicht bei der oben beschriebenen Körperhaltung in unmittelbare Nähe des auf ihn zu rotierenden Steines kommt, eine reichliche Menge Sandstein- und Eisenstaub in Mund und Nase. Beim Pliessten und Polieren atmen die Schleifer ausser dem feinen Eisenstaub noch Schmirgelstaub, Staub der Poliermittel u. s. w. ein. Besonders gefährlich ist das Polieren mit Wiener Kalk auf Bürstenscheiben.

Bei der Arbeit an nassen Steinen ist die Staubentwicklung nicht besonders gross, da der meiste Staub gleich niedergeschlagen wird. Dafür wird der Nassschleifer aber durch das von dem rotierenden Stein abfliessende Wasser oft vollständig durchnässt. Die Schleifer

setzen sich besonders häufig Erkältungen aus, weil sie vielfach die Gewohnheit haben, leicht bekleidet von ihrer erhitzenden Tätigkeit weg aus manchmal überheizten Räumen ins Freie zu gehen und sich dem Zuge auszusetzen.

SYMPTOME UND DIAGNOSE DER ERKRANKUNGEN.

(1) *Äussere Krankheiten.*—Bei den Hüttenarbeitern und Schmieden finden wir, infolge des Reizes, welchen der Staub und die strahlende Hitze auf die Haut ausüben, oft Ekzeme an den unbedeckten Körperteilen. Auch die Galvaniseure leiden durch die Berührung mit der Flüssigkeit des Bades nicht selten an chronischen Ekzemen der Hände und der Unterarme. Anlass zu Furunkelbildungen gibt der feine Kohlenstaub, der in Verbindung mit dem reichlichen Schweiss die Ausführungsgänge der Hautdrüsen bei den erstgenannten Arbeitern verstopft. Bei den Arbeitern, welche elektrisch schweissen, entstehen durch die starke Lichtentwicklung vielfach starke Hautreizungen. Zu der Rötung der Haut im Gesicht und an den Händen treten manchmal Blasenbildungen. Bei den Arbeitern tritt aber in der Regel eine Gewöhnung an die Bestrahlung ein.

Infolge des häufigen schroffen Temperaturwechsels erkranken die Hüttenarbeiter, die Schmiede und die Schleifer leicht an Rheumatismus, Ischias u. dergl.

Bei jugendlichen Arbeitern kommen durch das anhaltende Stehen bei der Arbeit und durch die professionelle Haltung leicht Deformitäten des Knochengerüstes zu stande. Bei Schlossern und Schmieden kommen Plattfüsse, bei Feilern und Schleifern Deformitäten des Brustkorbes und der Wirbelsäule auf diese Weise zu stande.

Die Hüttenarbeiter erleiden bei ihren schweren Arbeitsverrichtungen vielfach Muskelzerrungen und Zerreissungen am häufigsten in den Lendenmuskeln im Anschluss an das Aufheben schwerer Lasten.

(2) *Sinnesorgane.*—Bei den Feuerarbeitern entwickeln sich unter dem Einfluss des grellen Lichtes Bindehautkatarrhe und manchmal auch Linsentrübungen. Durch die intensive Lichtwirkung beim elektrischen Schweissverfahren kann die sogenannte "elektrische Ophthalmie" entstehen.

Anlass zu Bindehautkatarrhen bilden auch vielfach kleine Staubpartikelchen, die sich auf der Augenbindehaut ablagern. Durch die umhergeschleuderten Metall- und Schmirgelteilchen kommen ungemein häufig mehr oder weniger tiefgehende Verletzungen des Auges bei den Arbeitern in der Eisenindustrie vor.

Dass intensive Geräusche auf die Dauer eine zunehmende Schwerhörigkeit hervorrufen, ist eine allbekannte Tatsache. Nach den neuesten Forschungen seitens der Ohrenärzte, die durch mikrosko-

pische Untersuchungen einzelner Schläfenbeine von Individuen, die an Geräuschtaubheit gelitten hatten, zum grössten Teil aber durch Tierexperimente gewonnen worden sind, handelt es sich bei dieser Geräuschtaubheit um eine Verkümmerung der Endausbreitungen des Hörnerven. In den Betrieben der Eisenindustrie entsteht nun beim Walzen, Schmieden und Putzen der zu bearbeitenden Eisen- und Stahlteile ein so intensives Geräusch, dass sich in diesen Arbeitsräumen selbst durch lautes Schreien nicht verständlich machen kann. Daher ist der Prozentsatz der Arbeiter, welche an Berufsschwerhörigkeit leiden, in diesen Betrieben auffallend gross.

(3) *Luftwege.*—Der massenhafte Staub, dem ein grosser Prozentsatz der Eisenarbeiter ausgesetzt ist, wirkt auf die Dauer krankmachend zunächst auf die Nasenschleimhäute. Die erste Wirkung des Staubes ist eine irritierende. Bei jugendlichen Arbeitern zeigt sich diese Reizwirkung in Form von Ausschlägen am Naseneingange, Rötung und Schwellung der Nasenschleimhaut, Erosionen und kleinen Ulzera an der Nasenscheidewand, deren Bildung dadurch begünstigtwird, dass die Betreffenden die Staubmassen mit den Fingern aus der Nase zu entfernen geneigt sind. Nach längerer Einwirkung des Staubes wird die Nasenschleimhaut oft atrophisch. In diesem Stadium klagen die Leute über Trockenheit, Verlegung der Nase und Herabsetzung des Riechvermögens. Der atrophische Prozess hat zur Folge, dass die Nase ihre normalen Funktionen verliert, und dem Staub Zutritt zu dem übrigen Respirationstraktus gibt. Das lästige Trockenheitsgefühl dehnt sich auf den Hals aus, auch Hustenreiz und Auswurf mit geringen Bluteimengungen stören das Wohlbefinden der Arbeiter. Dann bieten die Schleimhäute des Rachens, des Kehlkopfes und der Bronchien mutatis mutandis dasselbe Bild, wie die Schleimhäute der Nase: Am Rachendach und an der hinteren Rachenwand liegen teils frische, teils zu Borken eingetrocknenete Staubmassen, die darunter gelegene Schleimhaut ist auch hier vielfach atrophisch. Die atrophischen Schleimhäute sind sehr oft hypästhetisch. Man sieht bei der laryngoskopischen Untersuchung nicht selten auf den Stimmbändern und auf der Schleimhaut der hinteren Kehlkopfwand oder der subglottischen Partieen Staubmassen, ohne dass wesentlicher Hustenreiz besteht. Diese Hypästhesie des Respirationstraktus befördert naturgemäss das Eindringen von Staubteilen bis in die kleinsten Verästelungen der Luftröhre und in das Lungengewebe selbst.

Die Wirkung des Staubes auf das Lungengewebe ist nun kurz folgende: Der Staub ballt sich in den Alveolen, wo er teils frei, teils in Zellen eingebettet liegt. Diese Ballen bedingen zugleich mit den direkt in das peribronchiale und perialveoläre Gewebe sich bohrenden Staubteilchen Entzündungen bis zu Schwielenbildungen, und der

Zerfall dieser mit Staub gefüllten fibrösen Entzündungsprodukte und des von ihnen umschlossenen Gewebes führt endlich zur Zerstörung der Lungen.

Zu den Staubkrankheiten der Luftwege gesellt sich dann schliesslich in einem grossen Teil der Fälle die Lungentuberkulose, der dann die Arbeiter über kurz oder lang erliegen, wenn sie nicht in hygienisch günstigere Verhältnisse kommen. Nach Sommerfeld entfielen von 100 Todesfällen auf Krankheiten der Atmungsorgane bei den Formern 62.5, bei den Gussputzern 60, auf Lungenschwindsucht bei den Formern 41.7, bei den Putzern 35.7. Derselbe Autor stellte für Schmiede folgendes fest: Von den in der Berliner Ortskrankenkasse der Schmiede in der Zeit von 1885–1895 vorgekommenen Todesfällen waren 75 Prozent durch Krankheiten der Atmungsorgane und 66.6 Prozent durch Lungenschwindsucht bedingt. Einer ausführlichen Besprechung bedürfen auch hier wieder die Erkrankungen der Schleifer, welche ich an der Hand unserer, oben bereits erwähnten Untersuchungen schildern möchte: Unter den 1.250 untersuchten Schleifern waren 150, 12 Prozent brustkrank, und zwar litten 40, 3.24 Prozent, an Emphysem, 17, 1.36 Prozent, hatten Reste von Pleuritis und 113, 9.04 Prozent, der Gesamtheit litten an chronischen Katarrhen der Luftröhre oder der Lunge. Von den mit Katarrhen behafteten litten 26 an chronischen Reizzuständen (Katarrh 1), 83 an Infiltrationen oder Indurationen der Lunge (Katarrh 2), und 4 an Zerstörungen der Lunge (Katarrh 3). Die leichten Katarrhe, welche wir mit Katarrh 1 bezeichneten sind ebenso wie im oberen Respirationstraktus als Reizzustände aufzufassen. Durch die Staubeinwirkung kommt es zu anfangs trockenem, später feuchtem Husten mit schleimigem, schleimig-eitrigem, staubigem, selbst blutig tingiertem Auswurf. Die Schleifer gewöhnen sich allmählig an den Staub, es tritt also bei ihnen, wie wir das bei der Besprechung der oberen Luftwege ausgeführt haben, eine Hypästhesie des Respirationstraktus ein. Diese Hypästhesie befördert nun sicher das Eindringen von Staubteilen in die tieferen Gewebe. Das Eindringen und Ansammeln des Staubes in der Tiefe wird ferner durch alle diejenigen Hilfursachen befördert, welche den Zutritt zu den tieferen Partieen begünstigen und welche das Wiederauswerfen erschweren. In erster Linie werden die mehr staubliefernden Arbeiten die Lunge stärker und eher gefährden. Die Schleifer welche nur trocken arbeiten, sind dementsprechend mehr gefährdet als die, welche trocken und nass schleifen. Wir fanden unter den Trockenschleifern 13.7 Prozent Lungenkranke und unter den Schleifern, welche trocken und nass schleifen, nur 11.3 Prozent. Ferner wird die gebückte Haltung welche die Schleifer bei der Arbeit einnehmen, ihren Thorax komprimieren, die Entfaltung der Lunge bei der Inspiration beschränken und so dem Staube Gelegenheit geben, sich in den

nicht entfalteten Partieen festzusetzen. Endlich werden die häufigen Erkältungen, denen sich die Schleifer aussetzen, soweit diese akute Bronchitiden, Pneumonien und Pleuritiden im Gefolge haben, die Widerstandsfähigkeit des Gewebes herabsetzen.

Bei den mit Infiltrationen oder Indurationen einhergehenden Katarrhen (Katarrh 2) kann man alle nur denkbaren auskultatorischen Phänomene beobachten, diffus oder umschrieben. An der Spitze befindet sich gewöhnlich die Dämpfung. Man findet in diesem Stadium ein stark eitriges, mehr oder weniger stark gefärbtes Sputum. Die beim Katarrh 3, dem letzten Stadium, oft auftretenden grösseren Blutungen sind auf Zerstörungsvorgänge zurückzuführen und dürfen mit den im Anfangsstadium dem Sputum zuweilen beigemengten Blutstreifen nicht verwechselt werden.

Wie wir oben schon auseinander gesetzt haben, ist die Tuberkulose eine rein accidentelle Erkrankung. Die mit Zerstörungen der Lunge (Katarrh 3) behafteten Schleifer sind aber sicher alle tuberkulös. Auch von den mit Katarrh 2 Behafteten ist ein grosser Prozentsatz tuberkulös, und bis in die Zahl der an Katarrh 1 Erkrankten wird sich die tuberkulöse Infektion sicherlich erstrecken.

Diesen Schilderungen entsprechend ist denn auch die Zahl der an Lungenerkrankungen zu grunde gehenden Schleifer von jeher in allen Ländern hoch gewesen. Über die Mortalitätsverhältnisse der amerikanischen Schleifer liegen nur ganz spärliche Berichte vor. Hoffman bringt in einer von dem Department of Commerce and Labor im Jahre 1908 herausgegebenen Arbeit folgende Zahlen: Bei einer gewerkschaftlichen Versicherungsgesellschaft waren unter 128 Todesfällen von Schleifern 63, oder 49.2 Prozent, durch Lungenschwindsucht herbeigeführt (Gesamte männliche Bevölkerung der Vereinigten Staaten über 15 Jahre, 14.8 Prozent), 15 durch Pneumonie, 5 durch Asthma und Bronchitis und 2 durch andere Erkrankungen der Luftwege. Insgesamt waren also 85, oder 66.4 Prozent, der Todesfälle bei den Schleifern durch Erkrankungen der Luftwege herbeigeführt. Die schon oben erwähnte Statistik des Dr. Scurfield berichtet über die Sheffielder Schleifer folgendes: In den Jahren 1901–1909 starben von tausend lebenden Schleifern 30.4, darunter 15.1 an Phthisis und 5.4 an anderen Erkrankungen der Luftwege, die entsprechenden Zahlen waren (1); für die sonstigen Arbeiter der Stahlwarenindustrie 29.3, 5.8, 6.9, and (2) für die gesamte über 20 Jahre alte männliche Bevölkerung Sheffields 16.6, 2.7, und 3.4. Günstig sieht es neuerdings in dem Hauptzentrum der deutschen Kleineisenindustrie, in Solingen aus. In den Jahren 1885 bis 1895 starben durchschnittlich von 1,000 lebenden Schleifern noch 12.82 an chronischen Erkrankungen der Atmungsorgane, in den Jahren 1904–1905 nur noch 7.82 und 1909–1910 war die Zahl auf 6.72

(4.37 an Tuberkulose und 2.35 an anderen Erkrankungen der Luftwege) heruntergegangen. Aber auch hier war die Sterblichkeit der Schleifer an Erkrankungen der Luftwege doch noch wesentlich höher als die der übrigen Stahlwarenarbeiter, bei denen von 1,000 Lebenden nur 4.43 (2.66 an Tuberkulose und 1.79 an anderen Erkrankungen der Atmungsorgane) in den Jahren 1909–1910 starben.

(4) *Vergiftungen.*—Den Hüttenarbeitern kann dass Kohlenoxydgas gefährlich werden: Durch Einatmung dieses Gases kommen akute Vergiftungen des menschlichen Organismus zu stande, die falls der Tod nicht eintritt, schwere Krankheitserscheinungen machen. Werden kleinere Mengen Kohlenoxydgas dauernd eingeatmet, so können chronische Vergiftungen eintreten. Unter Berücksichtigung der Anamnese ist die Diagnose der akuten Kohlenoxydgasvergiftungen meistens leicht zu stellen. Schwieriger ist die Diagnose der chronischen Vergiftung; in sehr vielen Fällen werden wir uns hier mit einer Wahrscheinlichkeitsdiagnose begnügen müssen.

Bei Feilenhauern kommt infolge der Bleistaubeinatmung und der ständigen Berührung mit Blei nicht selten Bleivergiftungen vor. Nach Sprenger erkrankten in Berlin von den mit Bleiunterlage arbeitenden Feilenhauern durchschnittlich jährlich 5.24 an Bleivergiftung.

Bei Feuervergoldern in der Schwertindustrie habe ich einige male Quecksilbervergiftung gesehen.

PROPHYLAXE.

Bei der Beurteilung der Morbidität und Mortalität der Industriearbeiter bleibt zu berücksichtigen, dass ihre Höhe abhängig ist einmal von der Widerstandskraft des Einzelnen und sodann von der Summe der auf ihn einwirkenden Schädlichkeitsmomente. Eine Abnahme der Erkrankungshäufigkeit und der Sterblichkeit kann mithin sowohl durch eine Hebung der Widerstandskraft des Einzelnen, wie durch eine Einschränkung der Schädlichkeitsmomente bewirkt werden. Wenn wir prophylaktische Massnahmen treffen wollen, so haben wir also nach dem eben gesagten ausser den Berufsschädlichkeiten u. a. noch zu berücksichtigen: Die Wohnungsverhältnisse, die Lebens- und Ernährungsweise und die wirtschaftliche Lage der Arbeiter. Damit stehen wir mitten in dem schwierigen Gebiete der Volkswirtschaftslehre. Fragen wir zunächst einmal, wer denn ausser dem einzelnen Arbeiter selbst Interesse an einem gesunden Arbeiterstande hat. Die ideellen Gesichtspunkte sollen dabei vollständig aus dem Spiele gelassen werden. Die Interessenten sind dann (1) der Staat, (2) die Kommunen, (3) die Arbeitgeber. Für den Staat und die Kommunen fallen die hohen Verluste an Men-

schenleben und Gesundheit in den jüngeren und Mittleren Lebensaltern wirtschaftlich ganz besonders schwer ins Gewicht.

Die Wehrkraft des Staates wird dadurch herabgesetzt, wenn der Industriearbeiter infolge der verschiedenen gesundheitsschädigenden Faktoren zur Zeit der Aushebung zum Militär schon so weit entartet ist, dass er der Militärpflicht nicht genügen kann. Sodann büssen Staat und Kommunen durch jeden Kranken oder vorzeitig sterbenden Arbeiter an Steuerkraft ein. Ferner werden die Armenlasten der Gemeinden durch jeden kranken oder vorzeitig verstorbenen Arbeiter, sofern er Familienhaupt war, in die Höhe getrieben. Die Arbeitgeber schliesslich wissen recht gut, dass die gesunden Arbeiter die billigsten Arbeitskräfte sind.

Was können nun die genannten Interessenten zur Hebung der Gesundheit der Industriearbeiter tun?

Der Staat hat die vornehme Pflicht, das Leben und die Gesundheit der Industriearbeiter durch eine geeignete Gesetzgebung zu schützen. Die Fabrikgesetzgebung muss darauf Bedacht nehmen, die Arbeitszeit in den Betrieben im allgemeinen zu regeln, im besonderen muss die ungemein aufreibende und nervenzerrüttende Nachtarbeit und die Arbeit der körperlich und sittlich in höherem Grade gefährdeten Frauen und Kinder geregelt werden.

Ferner gehört es zu den Obliegenheiten des Staates, für die bestmögliche Sanierung der Arbeitsstätten zu sorgen. Zu den sozialen Pflichten eines modernen Staates gehört auch die Arbeiterversicherungsgesetzgebung. Es sei nur noch kurz darauf hingewiesen, dass der Staat auch das Recht und die Pflicht hat, die Arbeitszeit in besonders gesundheitsgefährlichen Betrieben herabzusetzen. Es ist ja ohne weiteres verständlich, dass die Gesundheitsschädigungen um so mehr einwirken, je länger die Arbeitszeit ist.

Auch die Gemeinden können dazu beitragen, dass den Industriearbeitern das kostbare Gut der Gesundheit möglichst gewahrt bleibt. In erster Linie hat die Gemeindeverwaltung dafür zu sorgen, dass die Arbeiterwohnungen hygienisch einwandfrei sind. Denn wie ich schon oben anführte, kommt zu den Schädlichkeiten, welche die Berufstätigkeit des Fabrikarbeiters mit sich bringt, als konkurrierende Schädlichkeit eine unzweckmässige Wohnung hinzu. Die Gemeinden können hier helfend eingreifen durch alle Massnahmen, welche die Verbesserung und Ergänzung der Bauordnung, die Änderung der Bauweise für Wohngebäude u. s. w. zum Ziele haben. Ein alter hygienischer Lehrsatz besagt: Die Häufigkeit der Tuberkulose nimmt mit der Wohnungsdichtigkeit zu. Je dichter die Bevölkerung einer Gegend ist, um so mehr ist mithin seitens der Gemeinden inbezug auf öffentliche Gesundheitspflege zu tun. So haben die grösseren Gemeinwesen für gute Krankenhäuser, öffentliche Plätze und Anlagen, Kanalisation u. s. w. zu sorgen.

Eine grosse Verantwortung inbezug auf die Gesunderhaltung der Fabrikarbeiter hat nun ferner der dritte Interessent, der Arbeitgeber. Von seiner mehr oder weniger ausgeprägten sozialen Denkungsweise hängt in mancher Beziehung das Wohl und Wehe der Arbeiterschaar seines Betriebes ab. Was kann ein wohlwollender Arbeitgeber nicht alles zur Hebung der Gesundheitsverhältnisse seiner Arbeiter tun, wozu er gesetzlich nicht verpflichtet ist?

Alle die Interessenten können nun schliesslich, jeder an seinem Teile, durch Wort und Schrift, durch belehrende Vorträge, durch die Presse und durch populäre Broschüren dazu beitragen, dass die Arbeiter mit den Grundzügen der Hygiene vertraut gemacht werden; denn je mehr das Volk in diesen Fragen aufgeklärt wird, um so mehr Selbstzucht wird es üben lernen. Im besonderen sind die Arbeiter immer wieder auf die gesundheitlichen Gefahren ihres jeweiligen Berufes aufmerksam zu machen, auch sind ihnen Belehrungen zu geben, wie sie sich ihren Körper gesund erhalten können. Von eminenter Wichtigkeit ist eine vernünftige Körperpflege. In den Betrieben müssen Wasch- und Badeeinrichtungen vorhanden sein, damit die Arbeiter, nachdem sie ihre Fabrikkleider abgelegt haben, auch den mit Staub und Schweiss bedeckten Körper gründlich säubern können. Die Arbeitskleider sind in einem dafür hergerichteten Raume am besten so aufzubewahren, dass sie in der Zwischenzeit gründlich auslüften. Die Kleidung bei der Arbeit muss zweckmässig sein, sie soll der Beschäftigung entsprechen. Die in den Fabrikräumen oft herrschende Hitze, kann in etwa durch Ventilation gemildert werden. Die Arbeiter sind zur Mässigkeit im Genusse alkoholischer Getränke anzuhalten, gesundes Trinkwasser ist an möglichst vielen Stellen des Betriebes bereitzustellen, auch sollten andere durststillende alkoholfreie Getränke in den Fabriken zu billigen Preisen zu haben sein.

Von allergrösster Wichtigkeit für das Leben und die Gesundheit der Arbeiter sind alle Schutzmassnahmen, welche gegen die schädigenden Einwirkungen des Staubes, der Gase und Dämpfe getroffen werden. Als erster Grundsatz gilt hierbei: Der Staub oder die Gase müssen am Orte ihrer Entstehung resp. ihres Austrittes in die Arbeitsräume unschädlich gemacht werden. Was die Gase betrifft, so werden die Hochofengase in Deutschland jetzt in den meisten Betrieben abgeleitet, um zum Betriebe von Gaskraftmaschinen oder zu Beleuchtungszwecken verwandt zu werden. Sonst werden sie auch vielfach zum Vorwärmen der Gebläseluft, oder zum Heizen des Kessels benutzt. Die Gefährlichkeit der Gase in den Giessereien kann durch zweckmässig angelegte natürliche oder künstliche Ventilation auf ein Minimum reduziert werden. Bei den früher so gefürchteten Arbeiten des Reinigens und Reparierens der Gasleitungen kann man die Arbeiter durch Rauchmasken, Respiratoren, Mundschwämme u. s. w.

vor Gasvergiftungen schützen. Noch besser ist es, wenn die Gasleitungen so angelegt sind, dass sie möglichst von aussen zu reinigen sind. Wie wir oben ausgeführt haben, wird bei den Gussputzarbeiten sehr viel Staub entwickelt. Sind die Putztische oder die Schmirgelscheiben an eine Staubabsaugevorrichtung angeschlossen, so wird die Staubmenge, welche in die Arbeitsräume kommt, bedeutend verringert. Ein grosser Fortschritt ist es auch, wenn vermittelst des Sandstrahlgebläses unter gleichzeitiger Staubabsaugung geputzt wird.

In den Schmiedewerkstätten müssen Vorkehrungen getroffen werden, welche die Arbeiter vor der ausstrahlenden Hitze des Schmiedefeuers schützen, ferner müssen die Essen mit einem guten Abzuge versehen sein. Zur Besserung der Gesundheit der Schmiede trägt auch viel eine gute Körperpflege bei.

Die Gesundheitsverhältnisse der Feilenhauer können erheblich dadurch verbessert werden, dass anstatt der noch vielfach üblichen Bleiunterlage eine solche aus Zinn allgemein eingeführt wird, was nach Sachverständigenurteil ohne Nachteil für die Qualität der Ware geschehen kann. Ferner liesse sich die gesundheitsschädliche Körperhaltung der Feilenhauer bei der Arbeit in etwa dadurch korrigieren, das sowohl Arbeitschemel wie Amboss mit einer Vorrichtung zum Verstellen versehen würden. In den Metallschleifereien muss die Staubentwickelung möglichst verhindert und ihre Beseitigung energisch angestrebt werden. Zur Verhinderung der Staubentwickelung ist es geboten, nass zu schleifen wo es irgendwie möglich ist. Zur Beseitigung des Staubes am Ort der Entstehung dienen Absaugeeinrichtungen, auf deren möglichste technische Vervollkommnung hingearbeitet werden muss. Für den Regierungsbezirk Düsseldorf existiert eine strenge Polizeiverordnung über die Einrichtung und den Betrieb der Metallschleifereien, die ich in Anlage 1 zum Abdruck bringe. Auch für Sheffield sind ähnliche gesetzliche Verordnungen im Gange. Da selbst durch die vollkommensten Staubabsaugevorrichtungen das Eindringen des Staubes in den Schleifraum nicht ganz und gar wird verhindert werden können, so ist dafür Sorge zu tragen, dass der sich in den Schleifstuben und auf den Geräten ablagernde Staub möglichst oft und gründlich entfernt wird.

Für den Bezirk Solingen sind auch gesundheitliche Ratschläge für die Schleifer ausgearbeitet worden, die von den Behörden den Schleifern zur Beachtung empfohlen worden sind (vergl. Anlage 2). Durch alle diese Massnahmen ist im Solinger Bezirk im Laufe der Jahre eine bedeutende Besserung der Gesundheitsverhältnisse der Schleifer erzielt worden, die in dem andauernden Sinken der Mortalitätsziffer für die Schleifer zum Ausdruck kommt.

Anlage 1.

Polizeiverordnung betreffend die Einrichtung und den Betrieb der Metallschleifereien mit der Gültigkeit vom 1. November 1899 für den Regierungsbezirk Düsseldorf.

§ 1. Anlagen mit elementarer Kraft, in denen Metallwaren geschliffen, gepliesstet, poliert oder Scheiben geputzt werden, müssen geräumig und hoch sein, und ausreichende, zum Öffnen geeignete Fensterflächen besitzen.

Bei der Neuanlage oder Erweiterung einer Schleiferei muss in jedem Arbeitsraume die lichte Höhe mindestens 3.5 m, die zu öffnende Fensterfläche mindestens $\frac{1}{12}$ der Fussbodenfläche betragen und es muss für jede beschäftigte Person ein Mindestluftraum von 16 cbm vorhanden sein.

§ 2. Die Fussböden müssen fest und dicht sein, die Wände sind jährlich mindestens einmal frisch anzustreichen, zu kälken oder gründlich abzuwaschen.

Bei der Neuanlage oder Erweiterung einer Trockenschleiferei ist die Herstellung von Fussböden aus Lehm verboten.

§ 3. Die Fussböden und die nichtverdeckten, dem Staub ausgesetzten Triebwerke und Gerätschaften sind wöchentlich wenigstens einmal gründlich von Staub zu reinigen, dabei die Fussböden feucht aufzuwischen.

Die Schleifer haben ihre Arbeitsplätze jeden Abend staubfrei herzurichten.

§ 4. Die zum Trockenschleifen dienenden Steine und zum Bürsten und zum Trockengrobpliessten dienenden Scheiben, sowie diejenigen Polierscheiben und Vorrichtungen, an denen mit Wiener Kalk oder ähnlichen Staub verursachenden Poliermitteln gearbeitet wird, sind mit einer Staubsaugevorrichtung zu versehen, welche den vom Regierungspräsidenten erlassenen Vorschriften entspricht.

§ 5. Die Umhüllungskästen und die Rohre der Absaugevorrichtung müssen in allen Teilen sorgfältig gedichtet sein. Scharfe Richtungs- und Querschnittsveränderungen in der Rohrleitung sind zu vermeiden.

Der Umhüllungskasten darf nur soweit offen sein, wie es die Arbeit unbedingt erfordert. Die Rohrleitung ist so einzurichten, dass sie ohne Schwierigkeit gereinigt werden kann.

§ 6. Bei der Neuanlage oder Erweiterung einer Schleiferei ist die Absaugevorrichtung unter oder in den Fussboden zu legen. Die Hauptsaugerohre müssen derart gelagert werden, dass sie ein gleichmässiges Gefälle nach dem Luftsauger (ventilator, exhauster) haben.

§ 7. Es ist dafür Sorge zu tragen, dass die Staubsaugevorrichtungen den stehenden Bestimmungen entsprechend während der Arbeit

stets in Betrieb gesetzt und in Ordnungs mässigem Zustande erhalten werden.

§ 8. Das Abdrehen der Steine darf vor Schluss der Tagesarbeitszeit nur vorgenommen werden, wenn es entweder unter Zuführung von Wasser ohne Stauberzeugung geschieht, oder wenn ein Kasten vorhanden ist, in welchem der Stein, abgesehen von der Arbeitsstelle des Abdrehmeissels, völlig eingeschlossen, und welcher an eine kräftig wirkende Absaugevorrichtung derart angeschlossen wird, dass kein Staub in den Arbeitsraum gelangen kann.

Auf das tägliche Schleifen der Steine findet diese Vorschrift keine Anwendung.

§ 9. Der Schleifstaub muss ausserhalb der Arbeitsräume zweckentsprechend aufgefangen oder derart ins Freie geleitet werden, dass er nicht wieder in den Arbeitsraum gelangen kann. Auch muss eine Belästigung der Nachbarschaft durch Staub und unnötiges Geräusch des Luftsaugers ausgeschlossen sein.

§ 10. Sämtliche zum Schleifen der Messer, der Scheren und der Sägen, zum Nassschleifen der Schwerter, zum Trockenschleifen der Zangen und Beitel dienenden Steine, sowie sämtliche Schmirgelsteine müssen, sofern es nach der Art der zu verrichtenden Arbeit möglich ist, mit stets in gutem Anstrich erhaltenen Schutzböcken versehen sein, welche je nach dem fortschreitendem Verschleiss der Steine verstellbar, genügend stark und durchaus sicher verankert oder befestigt sind, sodass bei einem Zerspringen der Steine ein Fortfliegen der Sprungstücke verhindert wird. Für den Fall, dass die Neubeschaffung der Schutzböcke in einer bereits bestehenden Schleiferei mit erheblichen Kosten verbunden ist, kann die Polizeibehörde auf Antrag für die Anbringung der Schutzböcke eine Frist bis spätestens zum 1. Januar 1901 gewähren.

Der Regierungspräsident kann Ausnahmen, auch abgesehen von letzterem Falle und über die gedachte Frist hinaus zulassen. Ausnahmen dürfen jedoch nicht zugelassen werden, wenn es sich um Steine handelt, welche nach den Unfallverhütungsvorschriften der Berufsgenossenschaft schon jetzt mit Schutzböcken versehen sein müssen.

§ 11. Die Krafterzeuger, mit Ausnahme der Wasserräder, müssen mit sicher wirkenden Regulatoren versehen sein, welche ein Durchgehen des Krafterzeugers verhindern.

§ 12. Der Genuss von Branntwein in den Arbeitsräumen und deren Vorräumen während der regelmässigen Arbeitszeit ist verboten.

Betrunkene dürfen sich in den genannten Räumen nicht aufhalten.

Anlage 2.

GESUNDHEITLICHE RATSCHLÄGE FÜR SCHLEIFER IM STADT- UND LANDKREIS SOLINGEN.

Der Beruf des Schleifers gilt mir Recht für besonders gesundheitsschädlich. Die durchschnittliche Lebensdauer der Schleifer ist wesentlich kürzer als die anderer Bevölkerungsklassen. Es kann daher den Schleifern sowie den Eltern welche für ihre Kinder einen Beruf zu wählen haben, nur dringend empfohlen werden, zur Vermeidung der Gesundheitsschädigungen und ihrer Folgen nachstehende Ratschläge sorgfältig zu beachten:

I. Am ersten erkranken natürlich die Schleifer, die schon als Kinder wenig widerstandsfähig gewesen sind. Es ist daher Pflicht der Eltern und der Schleifermeister, darauf zu sehen, dass nur gesunde, kräftige Knaben das Schleifen lernen.

Schwächliche, kränkelnde Knaben sind auszuschliessen, insbesondere solche, die aus kranken Familien stammen, die selbst schon Erkrankungen der Lungen durchgemacht, die starke Drüsenschwellungen, Nasenerkrankungen und Hautausschläge haben oder zu Husten und Rheumatismus neigen.

Wünschenswert wäre es, wenn die Eltern Knaben, die Schleifer werden wollen, vor Eintritt in die Lehre ärztlich untersuchen lassen, wenigstens dann, wenn Zweifel über die Tauglichkeit bestehen.

II. Wie erhält sich nun der Schleifer seinen Körper gesund?

1. Der Hauptfeind des Schleifers ist der Staub, der bei der Arbeit erzeugt wird. Über Absaugung des Staubes, Reinigung der Schleifstellen u. s. w. gibt es polizeiliche Verordnungen. Es kann den Schleifern nicht dringend genug ans Herz gelegt werden, diese Vorschläge im Interesse der eigenen Gesundheit sehr ernst zu nehmen.

Ausserdem soll der Schleifer aber auch auf folgende Punkte achten:

2. Während der Arbeit soll er stets durch die Nase atmen; in der Nase wird die Luft filtriert und erwärmt. Atmet man durch den Mund, so kommt die nicht von Staub gereinigte Luft direkt in den Hals und in die Luftröhre und erzeugt dort Reizzustände, die auf die Dauer zu Erkrankungen der Luftwege führen müssen (Schleiferkrankheiten u. s. w.).

3. Eine möglichst gerade Körperhaltung bei der Arbeit ist anzustreben, weil nur bei dieser Haltung die Lungen wirklich ausgiebig atmen und sich in allen Teilen genügend ausdehnen können. Wenn bei langer Arbeit der Rücken lahm wird, so muss man sich zeitweise strecken.

Um die Angewöhnung an krummes Sitzen zu verhüten, tun die Meister gut, von vornherein bei den Lehrlingen auf gutes Sitzen bei der Arbeit zu achten.

4. Durchnässungen durch Schleifwasser können auf die Dauer leicht zu Erkältungen (Katarrhen und Rheumatismen) führen und müssen deswegen durch geeignete Kleidung, Schurz u. s. w. verhütet werden.

5. In der Frühstücks- und Vesperpause tut der Schleifer gut, den Arbeitsraum zu verlassen und wenn möglich in einem staub- und zugfreien Raum oder im Freien seine Mahlzeit einzunehmen. Während der Pausen sind die Schleifräume durch Öffnen der Fenster gründlich zu lüften.

Die Mittagsmahlzeit wird zweckmässig zu Hause eingenommen, weil sie auf diese Weise zu einem kurzen Spaziergang zwingt.

Bei jedem Verlassen des Arbeitsraumes muss natürlich der Rock zur Verhütung von Erkältungen angezogen werden.

6. Die Temperatur in den Schleifräumen soll möglichst gleichmässig und nicht zu warm sein (14° R.). Es empfiehlt sich falls die Luft in den Schleifräumen zu trocken wird, in ihnen Wasser verdunsten zu lassen.

7. Ausserdem ist möglichst dafür Sorge zu tragen, dass der Körper gegen die erwähnten Schädlichkeiten gestählt wird: Solides Leben, besonders Mässigkeit im Genuss von alkoholischen Getränken, Reinhalten des Körpers (Bad oder Abwaschungen), Lüften des Wohn- und besonders des Schlafzimmers, Benutzen jeglicher Gelegenheit zum Aufenthalt im Freien (Sonntagsspaziergänge) sind die hierfür geeigneten Mittel.

Stellen sich trotz aller Vorsicht Erscheinungen ein, die auf eingetretene oder bevorstehende Erkrankung deuten, so ist sofort ärztliche Hilfe in Anspruch zu nehmen.

Handelt es sich um Berufserkrankungen, so wird auf die besonders herausgegebenen " Ratschläge für Lungenkranke " Bezug genommen. Ihre Beschaffung ist den Krankenkassen empfohlen worden.

I. *Rhein. Hütten- u. Walzwerks- Berufsgenossenschaft.*

	Zahl der Versicherten.	Zahl der versicherungspflichtigen Unfälle.				Auf 1,000 Arbeiter kommen entschädigungspflichtige Unfälle.	Zahl der angemeldeten Unfälle.	Auf 1,000 Arbeiter kommen angemeldete Unfälle.
		Tod.	Dauernde Erwerbsunfähigkeit.		Vorübergehende Erwerbsunfähigkeit.			
			Teilweise.	Völlige.				
1907:								
Anzahl	171,672	220	1,930	154	444	16.1	30,260	176
Prozent		8.03	70.49	5.62	16.21			
1908:								
Anzahl	165,368	199	1,905	158	478	16.5	28,492	172
Prozent		7.25	69.32	5.79	17.47			
1909:								
Anzahl	165,470	183	1,630	198	513	15.2	27,895	169
Prozent		7.33	64.97	7.84	20.31			

II. *Rhein. Maschinenbau- u. Kleineisenindustrie Berufsgenossenschaft.*

1907:								
Anzahl	227,091	124	1,862	24	309	10.21	16,826	71.09
Prozent		5.38	80.29	1.03	13.33			
1908:								
Anzahl	223,330	117	1,871	27	358	10.63	15,631	69.99
Prozent		4.97	78.84	1.13	15.08			
1909:								
Anzahl	221,258	87	1,655	19	348	9.53	15,362	69.13
Prozent		4.12	78.47	0.90	16.50			

Von 1,000 Arbeitern der Stahlwaren-industrie starben im Jahresdurchschnitt—

Sterblichkeitstabelle.

	In Solingen (Krankenkassenstatistik), 1909–1910.[1]			In Sheffield (Dept. of the Medical Officer of Health), 1901–1909.[2]		
	Insgesamt.	An Tuberkulose.	An andere Erkrankungen der Atmungs-Organe.	Insgesamt.	An Tuberkulose.	An andere Erkrankungen der Atmungs-Organe.
Schleifer, Pliester, Polierer und Ausmacher (Grinding)	9.30	4.37	2.35	30.40	15.10	5.40
Sonstige Arbeiter der Stahlwaren-Industrie (Cutlery)	9.00	2.66	1.79	29.30	5.80	6.90

[1] Die Erhebungen erstrecken sich auf: 7,908 Schleifer und 10,872 sonstige Stahlwarenarbeiter.
[2] Die Erhebungen erstrecken sich auf: 3,941 Schleifer und 3,889 sonstige Stahlwarenarbeiter.
Von 1,000 Schleifern starben jährlich: 1885–1895, durchschnittlich 20.62; 1904–1905, durchschnittlich 10.95; 1909–1910, durchschnittlich 9.30.

ACCIDENTS PAR ÉLECTROCUTION.

Mesures préventives.—Secours à donner aux victimes.

M. Paul Weiss, Chief Mining Engineer of Paris, Ministry of Public Works, Paris, France.

L'administration française des Travaux Publics s'est dupuis longtemps, et bien avant le développement pris ces dernières années par l'industrie électrique, préoccupée de donner aux agents des services publics les instructions utiles pour remédier aux accidents par électrocution. Dès 1895 une circulaire ministérielle indiquait aux services locaux les principales règles à suivre: mesures techniques en vue de porter secours à la victime d'un accident, tout en protégeant les sauveteurs; mesures médicales conseillées en vue de limiter dans toute la mesure du possible, en attendant l'arrivée du médecin, les conséquences de l'accident.

Mais il n'est intervenu, en France, de réglementation complète en matière électrique qu'à la suite du vote par le Parlement de la loi du 15 juin 1906 sur les distributions d'énergie.

Un des principaux règlements issus de cette loi, l'arrêté ministériel du 21 mars 1908, déterminant les conditions techniques auxquelles doivent satisfaire les distributions d'énergie électrique, assure d'une manière générale la sécurité des installations. Afin de se tenir constamment au niveau des progrès de la science, cet arrêté technique est révisable chaque année, après avoir été étudié et préparé par un comité permanent d'électricité siégeant au Ministère des Travaux Publics, et composé par moitié des ingénieurs de l'État, par moitié des représentants des principales entreprises industrielles d'électricité en France.

Les ingénieurs des services locaux de contrôle demeurent d'ailleurs libres, aux termes mêmes de l'arrêté technique, d'ajouter aux prescriptions de ce règlement, toutes mesures convenables s'ils le jugent utile à la sécurité publique, quand ils sont appelés à examiner les projets de chaque entreprise à autoriser.

En outre des mesures qu'il édicte quant aux conditions techniques des ouvrages électriques, de leur disposition générale, de leur résistance mécanique, de la protection des édifices particuliers ou des services publics (télégraphe, navigation, chemins de fer, etc.), l'arrêté annuel du 21 mars prévoit, en l'un de ses articles (art. 36), l'affichage des prescriptions relatives à la sécurité dans les distributions à haute tension. Et c'est là proprement qu'il faut chercher la réglementation spéciale aux accidents électriques.

L'article précité dispose que les chefs d'industrie, directeurs ou gérants, sont tenus d'afficher dans un endroit apparent des salles contenant des installations à haute tension:

1°. Un ordre de service indiquant qu'il est dangereux et formellement interdit de toucher aux pièces métalliques ou conducteurs soumis à une haute tension, même avec des gants en caoutchouc, ou de se livrer à des travaux sur ces pièces ou conducteurs, même avec des outils à manche isolant;

2°. Des extraits de l'arrêté technique et une instruction sur les premiers soins à donner aux victimes des accidents électriques rédigée conformément aux termes qui seront fixés par une circulaire ministérielle.

La circulaire ministérille ainsi prévue a été adressée à tous les services du contrôle le 24 mai 1911, après avoir fait l'objet de longues et sérieuses études. L'administration, jugeant en effet que les instructions antérieures ne répondaient plus au progrès de la science électrique ni aux conditions nouvelles de l'utilisation de l'énergie électrique, a confié à une commission spéciale, composée d'hommes particulièrement compétents, sous la présidence de M. Georges

Weiss, membre de l'Académie de Médecine de Paris, le soin d'élaborer le texte de cette nouvelle circulaire. Constituée en novembre 1908, cette commission s'est livrée pendant plus de deux années à des expériences répétées faites sur des animaux, particulièrement des chiens, en vue de déterminer pratiquement et avec toute la précision possible en la matière, les phénomènes physiologiques provoqués par le passage de courants d'intensité, de tension et de fréquence différentes. Ces expériences, auxquelles se sont intéressées particulièrement la Société Internationale des Électriciens et l'Ecole de Médecine, ce qui témoigne de toute l'importance qui y fut attachée, n'ont pas porté sur moins de 44 sujets différents.

Sans entrer ici dans le détail des conclusions scientifiques, dont la plupart ne sont d'ailleurs pas nouvelles, auxquelles ces expériences ont abouti, on peut du moins les résumer très succinctement en passant:

1°. Toutes autres conditions restant égales, le danger du courant est en rapport avec l'intensité, du moins jusqu'à une certaine valeur, et avec le temps du passage du courant, ce danger étant particulièrement grave lorsque le cœur se trouve placé dans le circuit.

2°. Toutes autres conditions restant égales, la fréquence, entre les limites de 12 à 75 périodes, ne joue aucun rôle dans le danger résultant d'un contact avec un conducteur électrique.

3°. Le courant alternatif est plus dangereux que le courant continu; avec 110 volts en courants alternatifs il y a des cas de mort signalés.

Toutefois, la résistance du corps ne semble pas varier avec la nature du courant qui le traverse, à intensités égales. Les expériences mentrent que les chiens succombent lorsque l'intensité va atteindre 0.1 ampère en courant alternatif, tandis que la mort ne survient que par des intensités supérieures à 3/10 ampère lorsque le courant est continu.

4°. La théorie qui faisait quelquefois imputer la mort part électrocution à l'inhibition des centres nerveux, et en particulier à ceux qui commandent la respiration, ne semble pas fondée. En effet, toutes les fois que le cœur est exclu du circuit, l'animal résiste, avec des accidents cardiaques et respiratoires passagers, mais sans troubles définitifs; et si, dans certaines expériences on a pu noter, en même temps que l'arrêt du cœur, un arrêt momentané ou définitif de la respiration déterminant une asphyxie consécutive, on est en droit d'attribuer cet arrêt de la respiration à une contraction musculaire du thorax qui détermine la compression des organes respiratoires: cette contraction peut d'ailleurs être provoquée si on lance le courant dans le corps d'un animal mort depuis quelques instants. Elle doit donc être rattachée à une action musculaire excluant l'intervention prédominante du cœur; et il est encore à noter que dans le cas où les électrodes sont

placés sur le crâne et sous le menton, la respiration se rétablit seule, lorsque le courant cesse de passer, si, d'autre part, le cœur a repris ses mouvements normaux. Dans certains cas la respiration à peu près suspendue, 80 à 90 secondes, reprend tout naturellement son cours régulier, lorsque le courant est supprimé: constatation des plus importantes à retenir pour les soins à donner aux foudroyés.

L'observation la plus grave, qui se rattache à la conclusion No. 1 rappelée ci-dessus en termes généraux, est celle qui fait varier le danger du courant avec son intensité: on est en effet conduit par les faits observés à conclure que les courants industriels employés dans les applications domestiques et en particulier à l'éclairage, peuvent, dans certaines conditions de contact, devenir dangereux et même mortels. Il suffirait pour déterminer la mort qu'une intensité de courant 0 ampère 100 fût possible à travers le corps de la victime. Certains accidents survenus dans ces dernières années confirment cette conclusion.

De ces expériences sont sorties les instructions portées à la connaissance des industriels, des ouvriers électriciens et du public, sous la forme de deux affiches, dont l'une s'adresse aux ouvriers électriciens, l'autre au public en général.

La première est destinée à être placardée seulement dans les usines. La seconde doit être placardée, par les soins des industriels, à l'extérieur des usines et au voisinage des lignes à haute tension. Les préfets des Départements et les ingénieurs des services de contrôle locaux ont été invités en outre à la faire apposer aux portes des mairies et dans les écoles. Plus de 100,000 exemplaires de cette deuxième affiche leur ont été adressés à cet effet: un seul Département, silonné de nombreuses lignes électriques, le Department du Nord, en a demandé à lui seul 4,000. Les autorités municipales ont été engagées à multiplier un affichage destiné à permettre au public de secourir les victimes des accidents électriques et de se garder des dangers qui menacent, en pareil cas, des sauveteurs ignorants ou imprudents.

Les instructions contenues dans les affiches ont été rédigées avec un souci prédominant de clarté et de simplicité, de manière à les rendre accessible à tous. Il ne pouvait être question de faire figurer, dans des documents destinés à la masse du public, aucune des considérations d'ordre théorique et scientifique qui avaient pu, au fond, en inspirer les termes. La commission chargée d'en préparer le texte s'est contentée d'indiquer brièvement les moyens et précautions à prendre pour écarter la victime des conducteurs d'énergie, et les méthodes par lesquelles, en attendant le secours d'un médecin, on peut rétablir, chez l'électrocuté, la respiration et la circulation: traction rythmée de la langue et respiration artificielle. Il était

essentiel de ne pas perdre de vue que des instructions plus complètes risquaient d'embarrasser le public auquel s'adressent ces affiches, ou de retarder une intervention dont la promptitude seule assure dans bien des cas l'efficacité. On ne saurait faire un grief à ces instructions d'être sommaires; bien plutôt il les en faut louer.

Est-il permis d'espérer que, grâce à la diffusion de ces avertissements au public, les accidents électriques sont appelés à devenir moins fréquents? Il est à remarquer que la plupart des victimes de ces sortes d'accidents, loin d'être des profanes, sont des ouvriers électriciens ou des travailleurs avertis du danger auquel pourtant ils succombent. Inadvertance et imprudence sont ici plus dangereux que l'ignorance même. Dans la mesure toutefois où une réglementation quelconque peut en pareille matière aboutir à un résultat précis, celle que nous avons exposée nous paraît suffire. L'Administration de L'Instruction Publique s'efforce, pour sa part, de répandre dans les écoles primaires françaises les mêmes idées, de pénétrer l'esprit des enfants, dès le plus jeune âge, du péril que présente toute installation électrique et de leur inculquer la notion des mesures essentielles à prendre en cas d'accident. Des conférences sont faites par les instituteurs; des projections mettent sous les yeux des élèves ce que le livre le mieux fait leur ferait mal comprendre. Il semble qu'il ne puisse être de meilleure manière de faire entrer dans l'esprit public les rudiments d'une science que ses applications industrielles multipliées rendent nécessaire à tous.

Le jour où nul n'ignorera ces rudiments, les services de contrôle assurant d'autre part l'exécution stricte d'une législation technique sans cesse renouvelée et mise à jour, on peut penser qu'il ne sera plus rien laissé au hasard, si ce n'est ce que l'homme, avec toute sa science et son meilleur effort, ne peut lui ôter par calcul ni par prévoyance.

WEDNESDAY MORNING, SEPTEMBER 25, 1912.

THE INCIDENCE OF INDUSTRIAL ANTHRAX IN LIVERPOOL.

Dr. E. W. Hope, medical officer of health, city and port of Liverpool, and professor of hygiene, Liverpool University; and Dr. W. Hanna, assistant medical officer.

The incidence of anthrax amongst a community is always closely associated with the handling of infected material, such as carcasses of animals which have died from the disease, or with animal products derived from such sources. Hides, wool, or hair are therefore sources of danger in this respect, and the occurence of anthrax amongst those who handle these and similar articles is a matter of great public-health importance. During the past 10 years or so, we have had the disease under close observation in the port and city of Liverpool. The importation of large quantities of animal products at our great seaport has furnished us with ample material to form the subject matter of this paper.

Anthrax is a disease known in its clinical aspects for a very long time, and is of very wide geographical distribution. Its prevalence in industrial communities has been much studied, and preventive measures of more or less value have been put in force. The results, however, have been in some respects unsatisfactory, and outbreaks and cases still continue to occur. The disease, owing in all probability to the highly protected spores, has resisted our preventive efforts almost more than any other infectious disease.

ANTHRAX IN ANIMALS.

Anthrax is a common disease amongst animals, chiefly of the more or less domesticated kinds, such as cattle, sheep, goats, and so forth, in various parts of the world; but, outside Europe and America, our knowledge of the extent of its prevalence is still far from satisfactory. Especially is this the case as regards China, Siberia, Persia, Africa, and certain parts of South America.

Certain parts of the world are endemic centers of the disease, owing to the lax way in which the infected and dying animals are treated. When an animal shows signs of the first symptoms of the disease,

its throat is usually cut or very frequently the owner of the animal, as sometimes happens, knows nothing of the illness until the death of the animal has occurred. The hide or fleece is then removed and sold, should a suitable buyer be in the neighborhood. The carcass may be consumed, or left, with the entrails, to further infect the ground in the neighborhood. It is obvious, then, that where no government control is exercised over the spread of the disease in these countries, no special measures of precaution can be expected from the peasantry. The proper disposal of the carcass is therefore not assured, and, as a result, large numbers of infected hides and much hair and wool are imported into this country and manufactured into leather, haircloth, rugs, felt, and so forth.

The bacilli of anthrax soon die out when dried at ordinary temperatures, but, under suitable conditions, spores are found. The infection, in the form of spores inclosed in blood clots, dried and caked on the hair and wool, is the chief source of spread of infection, owing to the clots breaking up into the form of dust.

The bales of skins and wool which are imported frequently contain infected or "fallen" skins or fleeces which are derived from dead animals and which have been packed up with the good skins and fleeces.

The dust arising in the handling, sorting, and other manipulations of imported animal products is always to be found in more or less quantity where these operations are carried on. Where it is in quantity, the spores are easily carried into the lungs in breathing, or ingested during swallowing. More usually it collects on clothing or finds an entrance into broken skin by a cut or bruise or scratched pimple, being deposited there from the air, or rubbed in by the dusty fingers or clothing.

WOOL.

This term technically includes wool and hair from various animals, chiefly sheep, goats, mohair, camel, and alpaca.

The most dangerous are the dusty wools and those containing fallen fleeces (i. e., from dead animals) amongst them. The wool of these fleeces is dull and lusterless, and has lost much of its elasticity; the practice of false packing, or putting blood-stained material inside clean fleeces, is much more prevalent than formerly; this is chiefly the case in regard to Persian wool. It is a very dangerous practice, and representations on this subject have been made by the anthrax investigation board of Bradford to Persian wool merchants.

The dusty wools and those most likely to cause anthrax are mohair, Persian, camel hair, and cashmere.

HAIR.

Another dangerous animal product is horsehair, derived chiefly from European Russia, Siberia, China, and Mongolia. This hair is collected by agents, who buy from knackers or horse slaughterers and others at various country markets; it is sorted out, packed in bags, and sent direct through Riga, Hamburg, or Antwerp, to England, to hair factories.

Pigs' bristles and pigs' wool also convey infection, although rarely.

HIDES.

Hides and skins for tanning purposes are very often the cause of anthrax in man. The hides are cured abroad in many ways, which vary according to the country of origin.

The curing may be either by drying in the sun, especially in Africa, East India, and South America, or they may be cured by salt or saltpeter, or treated with arsenic solution, as in the case of those from China.

Some hides from India are soil cured, i. e., rubbed with soil which contains a large amount of niter and dried.

The spread of anthrax to cattle in England, by means of imported animal products, has also received much attention. Investigation has been directed to the close association of infected animal products with cattle foods on shipboard, thereby carrying the disease to farm animals. Effluents from tanneries are also very dangerous to cattle grazing on land to which the fluids have access, for it has been shown that the spores of anthrax pass through the various tanning liquors without harmful effects.

The port of Liverpool receives large shipments of all these materials, but chiefly wool and hides. They come from all parts of the world, and large numbers of bales are transshipped to the United States of America.

The cases arising in association with the importation of the foregoing animal products at the port and city of Liverpool numbered 60, covering a period of about eight years; 36 of these were dock laborers or carters engaged in the discharge of the cargoes of ships in dock, and a large proportion of them were infected in the unloading or carting of hides, either loose or in bales; 7 contracted infection in handling horsehair or bristles in hair factories, while 13 were engaged in handling or sorting wools, such as sheep's wool or goat hair in wool warehouses; another case was infected in a local tannery; 2 interesting cases were female bag menders who worked among secondhand bags, and the particular bags on which one was engaged, in all probability, had contained wool or hair, and in the other case

the bags had contained dried Egyptian cattle bones. These cases are comparable with 2 at Hamburg, where infection arose in mending tarpaulins which had covered sheep wool. Another case occurred at a patent manure works.

The hides causing infection came from all parts of the world, but chiefly from China and the East Indies.

The material causing inspection in the case of hair was derived from Russian sources.

SITE AND SEVERITY.

The uncovered parts of the skin were, in nearly all cases, affected in the external form of the disease. The site of election in 25 cases was the neck, and in 20 cases the cheek. Other sites for the pustule were the chin, lips, nose, forehead, forearm, and shoulder. In the latter case the man was struck on the shoulder by a box and his skin injured by a projecting nail. He had been handling Rangoon hides at the same time, and carried the infection to the wound with his dusty fingers. In the case of dock laborers the pustule was mostly situated on the neck. The cases were nearly all of a severe type, and there were 20 deaths. It seems very probable that many slight forms of the disease may be overlooked by the patients or be undiagnosed by the medical attendant. This neglect will not occur to such an extent amongst wool and hair sorters and amongst those constantly employed in one special branch of work, who have come to know the early signs of the disease and its dangers. Amongst dock laborers and carters, on the other hand, who are constantly changing the character of their work, this elementary knowledge of the disease will be wanting.

Samples of the hair and hides amongst which the patients worked have been in nearly every case examined bacteriologically, but in few cases have positive results been obtained. The anthrax bacilli, however, have been isolated from samples of hides, wool, and hair which caused infection. It frequently happens that, by the time the case comes to the notice of the health department, the goods have been reshipped or sent to tanning pits or have been divided up. As a rule, however, hides and wool in bales can be satisfactorily traced.

PREVENTIVE MEASURES.

To shortly review the preventive measures in force at the present time we may state that in industrial centers in England the factory and workshops act, 1901, section 73, requires that every medical practitioner attending on or called in to visit a patient with anthrax shall notify the chief inspector of factories at the home office in London. This notification starts the usual routine inquiries and

preventive measures taken by the local medical officer of health and inspector of factories.

Regulations have also been made by the secretary of state regarding the handling of dangerous material in factories and workshops.

WOOL AND HAIR.

For example, in factories where wool and hair are handled the regulations are intended to reduce the amount of dust and the likelihood of infection during sorting and handling. These regulations are very complete. Certain classes of wool, known to be dangerous, are scheduled and precautions taken in regard to the opening of bales and sorting by proper steeping or opening over an efficient opening screen with extracting fan. No damaged wool or hair of the dangerous sorts shall be sorted except after being washed. The regulations also advise regarding the storage of wool and hair, and the picking clean of bags without brushing. All the dust in the opening screens and sorting boards shall be discharged into proper receptacles and, in addition, overalls and respirators shall be provided.

The anthrax investigation board of Bradford has done much during the past five years to elucidate the subject of anthrax as far as it affects the wool industry. The investigations have determined that certain disinfectants will effectually destroy the spores when the material can be steeped, prior to washing, in a loose state, so as to afford penetration. This is, however, extremely difficult when dealing with bales containing matted and blood-stained wool.

In the search for anthrax bacilli in wool supposed to have given rise to infection, positive results are more likely to be obtained from samples which give the chemical reactions of blood. Hair and wool containing blood should be sought for and every care exercised in dealing with blood-stained material.

The regulations dealing with the manipulation of horse-hair and pigs' bristles are similar to those for wool. Efforts to disinfect hair by means of steam have been made from time to time, but it has been found to be unsatisfactory, rendering the hair brittle and changing the color of white hair, which becomes yellow.

In Germany elaborate regulations are in force regarding the treatment of wool. They are, in the main, similar to the English regulations.

HIDES AND SKINS.

The precautions in connection with hides and skins are almost as necessary as with wool and hair; the risks arising from infected hides and skins being very great, especially during the importation, handling, and carting.

The rules emphasize that care should be exercised in regard to storage, and the dangers to workmen amongst hides and skins who have wounds or scratches on the body; it is recommended to wear suitable overalls to protect the neck and arms, and it is also advised to wear protective gloves.

Protective gauntlets have been provided for their workmen by many shipping firms in Liverpool, but the difficulty of getting the men to wear them is very great. Gloves are no doubt a protection, but they may also harbor infection by dust finding its way into the interior, and they therefore require occasional disinfection.

Notices have been issued by the chief inspector of factories regarding anthrax, as to the channels of infection, the need of prompt recognition, and immediate attendance at hospital for treatment.

In the beginning of 1906 the cases of anthrax became so frequent that the Liverpool port medical officer, Dr. Hope, issued a circular letter directing the attention of shipowners to the recommendations of the chief inspector, especially with regard to the wearing of gloves. At Hamburg, Marseille, Antwerp, Genoa, and other large ports similar regulations are in force.

In America it is also essential, according to United States Federal law, that all hides imported into the United States of America must be disinfected before shipment in the country of origin, except such countries as are free from contagious or infectious diseases of animals. Unless the imported hides are accompanied by a consular certificate, stating that they have come from an anthrax-free country or have been disinfected, they are not allowed to be landed.

A circular of the United States Treasury Department, dated 1901, directs all customs officers, with a view to preventing the spread of contagious diseases amongst cattle, to treat as prohibited importations all hides of cattle, calf skins, hide cuttings, and so forth, except such as have been dry salted, arsenic cured, or lime dried, after soaking for 40 days in strong solution of lime, and, except abattoir hides, the product of Sweden, Norway, and Great Britain, in all cases where the invoices are not accompanied by proper certificates of disinfection.

It would seem that, in the United States, the authorities regard the dry salting and arsenic or lime curing of hides sufficient to render them innocuous. As far as we can learn, this is the case with hides from India, but great care is exercised in handling hides from China. From inquiries made it does not seem that in America there are any special local regulations for the handling of hides.

Dried hides, whether sun dried or treated with arsenic or lime, are more often responsible for causing infection than the wet kind, and Dr. Hamer, of the London County Council, some years ago recommended the substitution of wet for dry hides. So far, no effort has

been made in this direction, the chief factor against it being the increase in weight of the consignment.

The methods of prevention, short of disinfection, which, in the opinion of many, can not be carried out in a practical and effectual manner, may be summarized as follows:

1. Notices and circular letters to educate workmen and their employers.
2. Hides from infected and suspected localities to be scheduled and treated carefully.
3. Dry hides and skins to be imported in large canvas-covered bales, and mechanical means used for removal.
4. Wet instead of dry hides.
5. No hides to be carried on the shoulders.
6. Sheds and store places for wool and hides to be wet cleaned and disinfected.
7. Infected material traced to source and means taken to eradicate the disease.

THE COMPULSORY NOTIFICATION OF ANTHRAX.

Cases frequently occur in Liverpool amongst workers in places which are not under the factory and workshop acts as regards notification: for example, amongst carters in docks and quays and amongst sorters in wool warehouses or skin stores. The local health authorities in Liverpool therefore thought it advisable to make the disease notifiable to the medical officer of health under the infectious diseases (notification) act of 1889. This gives the health department of the local authority all information regarding cases of this disease, and prompt notification and disinfection of the material is of importance to the public health.

CONTAMINATION OF CATTLE FOODS.

The association of the spread of anthrax amongst animals with the contamination of cattle foods with the spores of the bacillus during shipment in foreign ports or during the voyage has led the British board of agriculture to issue a notice to shipowners, pointing out that special precautions ought to be adopted where cargo containing animal products likely to contain infection (such as hides, horsehair, and wool) is carried in the hold to secure the most thorough disinfection of the hold and other parts before such places are used for carrying any cargo likely to be used as cattle food.

In conclusion, the following facts in connection with our efforts in Liverpool stand out as worthy of mention:

1. That the number of cases of anthrax in man shows a tendency to diminish, owing to more care being exercised in handling material.

2. That the deaths are much fewer than in former years, chiefly due to earlier recognition and prompt treatment in hospital by excision and administration of Sclavo's serum.

3. That the danger of anthrax from foreign imported animal products has not diminished.

THE ECONOMIC ASPECTS OF HOOKWORM DISEASE IN PORTO RICO.

BAILEY K. ASHFORD, M. D. Sc. D.; Major, Medical Corps, United States Army; member of the late Porto Rico Anemia Commission.

The island of Porto Rico, with its 3,606 square miles of territory and 1,120,000 inhabitants, is almost exclusively devoted to the culture of sugar, tobacco, coffee, and fruit, named in the order of their importance in 1912; sugar in the coast lands, tobacco in the foothills and some mountain valleys, and coffee in the mountainous regions.

As fully three-fourths of all labor performed on the island is agricultural labor, and the output of each plantation depends largely upon the laboring capacity of those engaged in tilling the soil, given the fact that all vegetation is luxuriant and no serious natural conditions hinder the raising of large crops, a study of the great scourge of the laboring classes, uncinariasis, will throw a flood of light upon heretofore obscure factors in the economic development of Porto Rico during the past 15 years, perhaps through centuries preceding this period.

The value of the coffee crop in 1897, American gold, was $7,492,453; that of sugar, $2,456,898; and that of tobacco, $732,117. Coffee formed 70 per cent of the value of all the exports in 1895–1897, and 41 per cent of all cultivated land was devoted to its production.

In 1910 the value of sugar exported was $23,545,922, representing over 60 per cent of all products leaving the island; of coffee, $5,669,602; of tobacco, $5,664,128.

The total value of articles purchased from and exported to the United States in 1901 was $17,502,103, and in the fiscal year 1910, $68,595,326, a gain within 10 years of 400 per cent.

Thus we see sugar to-day the life-giving product of Porto Rico, with an increase of seventeenfold its value in 1897; tobacco a promising industry which is seven and one-half times as important as formerly, and coffee a struggling industry, which has but 75 per cent of the value it possessed in the days of Spain.

Our study can not embrace a detailed consideration of the economic problem, but let it suffice to say:

1. That sugar rose in value when it came under the protective tariff of the United States.

Coffee fell when Spain's preferential tariff was removed, and although the bean was of a superior class, it was unknown and unappreciated in the only free market open to it, the United States, where it had to compete with cheap grades.

2. That the output of sugar was enormously increased by improved methods of culture and by great mills, now among the largest of their kind in the world.

Coffee culture has progressed very little, if any, in improved methods; first, because, from the nature of the industry, machinery plays an unimportant part in its preparation for the market; second, because the coffee planters were so poor that they were unable to keep their estates at anywhere near their full productive capacity, the bushes needing manual attention continually to increase the output. The value of the crop often barely sufficed to pay the interest on their mortgages, and was totally insufficient to meet the expense of improvements tending to increase their production, especially as loans could with great difficulty be floated.

3. Sugar rose to the surface in an increasing era of prosperity, unhampered by any convulsion of nature, and favored by the benign influences above cited.

Coffee planters were surprised by the war in the midst of speculation and borrowing. Their estates, and even their ripening crop, heavily mortgaged, were visited one year after the American occupation by a disastrous hurricane, which dashed to the ground in a day the coffee bushes and, worst of all, the shade trees, which are necessary for the superior quality of the bean, thus precluding resuscitation of former crop values for at least five years. Many other factors which tended to depreciate the industry might be mentioned, but a fourth element of highest importance remains to be noted.

4. Sugar lands and, to a less extent, those of tobacco, bereft of shade and bathed by a hot sun are notoriously poorer culture grounds for *Necator Americanus* than those of coffee. They are far drier, are well plowed, and well drained.

Coffee groves well shaded, always sopping wet and generally undrained, and, above all, far more densely worked, are among the most perfect culture grounds for this parasite in the world.

Moreover, the laborers in sugar estates were chiefly negroes who are relatively immune to uncinariasis. They were and still are better paid, better housed, and better clothed than the poor white coffee laborer, with a constitution weakened by chilling, damp winds, insufficient clothing, insufficient and improper food, and general poverty and wretchedness.

The result has been that the lands previously cultivated in tobacco and coffee have, wherever possible, been encroached upon by sugar; that tobacco, increasing in importance, has seized upon coffee lands

which are very materially diminished in area and driven clear to the mountain fastnesses, where they are generally isolated by lack of roads over which to bring their products to the coast.

We are now in a position to understand why the coffee crop in 1901 was valued at but $1,678,765. In 1904, in part due to partial recuperation of the coffee groves after the hurricane, in part to better prices, it was valued at $3,903,257. From 1904 on, the area of land under cultivation for coffee has steadily diminished and yet the crop has as steadily increased, until in 1910 it was valued at $5,669,902. This means practically but one thing—increase in production. It has not been great but it is perceptible.

Anyone who knows anything about Porto Rico will realize instantly the precarious condition of her commercial future, when one reflects that upon one product, sugar, and the market price of that product, depends her prosperity. Sugar is to-day, relatively speaking, where coffee was in 1897. Let the duty fall from sugar, and tobacco, as yet a weak industry, and coffee, a struggling one, must together support the island. Sugar this day is the mainstay of Porto Rico, but it is far from being the workingman's ideal crop. Only rich men and powerful corporations can grind sugar. Only the big ones financially can supply these mills with enough cane to make them pay. Coffee is the country gentleman's crop, the poor man's crop, the Porto Rican's crop. Even when coffee brought but seven and a half millions of dollars a year to Porto Rico, the "jibaro," or poor white coffee laborer, was better off. His dollar "went further." Coffee holdings are small holdings and they well distribute wealth here. Why was coffee so depressed in 1900–1906, when every other industry was booming? The answer of coffee planters was concise "There is no coffee!" What they meant was that the per-acre production was utterly inadequate. That this is improving is seen in the figures above cited. The improvement is attributed by some to this factor, by others to that, but no one, no matter how blind, fails to realize that healthy, strong, and abundant labor pays a tremendous part in the future of the coffee industry in the island of Porto Rico.

Thus we can establish the inseparable relation of the health of the coffee laborer to the welfare of the industry; thus we, as medical men, can justly lay claim to a share in the awakening of that industry which in its palmy days brought happiness and contentment to the people of Porto Rico, for in 1904 a campaign was instituted against "anemia," or uncinariasis, the chief cause of the invaliding of the Porto Rican laborer, especially of the coffee laborer, which has culminated in the successful treatment of 300,000 persons of this class. No Porto Rican is capable of denying to the 40 or 50 physicians whose efforts through six years have accomplished this result a part in the financial betterment of his people after this tremendous campaign.

Dividing the island into the municipalities bordering on the coast and those of the interior we find that of the former out of a total population of 618,871 persons, 117,989, or 19 per cent, were treated for uncinariasis, and that of the interior 130,989 of a population of 334,372, or 39 per cent, were so treated. A little over 50,000 were migratory, and their residence could not be fixed. The unit of division, politically speaking, is the municipality, as is the county in the United States, but topographically, while the 24 interior municipalities are in the highlands and chiefly devoted to coffee culture, and secondarily to tobacco, a considerable part of the area of a coast municipality is apt to extend well back into the mountains, and of course such territory is given over to coffee. So it may be said without fear of error that not over one-tenth of those seeking treatment for their anemia were sugar laborers, not over one-fifth tobacco workers, and the rest came from coffee groves.

In the rehabilitation of this coffee industry only one plan is feasible—to increase per-acre production. And to do this workingmen capable of 100 per cent of labor daily are needed. Until anemia among this class is thoroughly under control this will be impossible.

THE LABORER.

He is a tiller of the soil pure and simple, living by sufferance in a rude hut he built, but whose ground he does not own. With a large family he is powerless to save a cent of his earnings, and, as Weyl puts it, it would be a crime for him to attempt it. When not a victim of anemia he is usually a well-nourished, well-built man of medium stature, reserved, deeply suspicious of strangers, unschooled, but astute, generous, and respectful. Again eliminating anemia, his diseases are few, as are his vices. He is long-suffering and, above all, hard working, but his methods of labor are primitive and wasteful. He is totally dependent upon the outcome of the crop he labors to realize, and not being a landowner, unable to read and write, he looks to the planter he serves for protection and ideas.

In the mountains, he is a coffee laborer and a white man. On the coast, he is more frequently a negro or a mulatto, notwithstanding the tendency of late years for the white coffee laborer to work in the sugar fields during the inactive season in the coffee plantation. His food is confined,practically to native vegetables and fruits, with rice, codfish, coffee, and condiments. His diet lacks animal proteids and fats, and would be considered below par in Europe and North America. Take away his wage, and he lives from hand to mouth on native fruits and vegetables, for rice, codfish, and condiments he must buy.

That Spain's protection of coffee merely brought about a value of seven and a half millions of dollars in 1897, when, in 1911, five and a half millions were rendered by far less coffee land, without any protection, and with the stormy past already recounted, must be considered notable. Something was certainly missing. When we consider that, from 1890 to 1899, the percentage of deaths from "anemia" to the total death rate gradually climbed from 13 to 22½; when we take into account the testimony of druggists and physicians practicing in those days to the effect that they flourished on the generous sums spent to secure medicine and medical attendance by the laborers; when we realize that when 15 per cent of the total death rate is due to anemia the hemoglobin of the average laborer is not far from 50 or 60 per cent: we can not but see that Spain's best endeavor fell short because of the invaliding of the laborer. Could sugar have attained a value of $25,000,000 a year with a laborer whose hemoglobin is but 60 per cent? We believe not. A sugar planter fights shy of a physical wreck when he is looking for his laborers, for the work is hard, and requires strong men.

When we Americans first landed in Porto Rico, our attention was attracted by the muddy-yellow pallor of the average laborer in the country. At worst, the anemia of uncinariasis is really a rare cause of death in Europe and North America. Even severe cases are, apparently, very uncommon. What is justly feared is the diminution in laboring capacity. But in Porto Rico, with about 300 persons to the square mile, with ideal cultural conditions for the larvæ, and with small coffee estates in whose shady groves hundreds of barefooted workers daily congregate, clearing underbrush or picking coffee, and continually befouling the soil, each laborer receives an almost daily dose of Necator Americanus, a series of multiple infections that fairly break through the most impervious natural immunity, and leave an entire class anemic, with a frightful death rate, impossible to comprehend outside of Porto Rico. When it can be said that 30 per cent of all deaths truly occurred from anemia in 1900, that over 60 per cent of these deaths occurred in the mountains, and that 2 of every 100 died yearly of uncinariasis, has anyone any lingering doubt about the physical condition of the other 98 who lived and were infected under the same conditions as the two unfortunates who lost their lives?

To be more explicit—the hemoglobin of 577 persons presenting themselves for treatment in the Bayamon dispensary in 1904, averaged 43.09 per cent. This was at the very beginning of our campaign, and is an especially valuable note, because Bayamon is a coast town where anemia should have been least prominent, but which, nevertheless, represented the laboring class of sugar, coffee, tobacco,

and fruit estates, the industries of that rich municipality at that time.

In the same campaign of 1904–5, of a total of 5,490 treated personally by myself and two associates 22 per cent were light or very light cases, 19 per cent were moderate, 41 per cent were intense or very intense, and 18 per cent were unclassified. In six years' campaign, in which 287,528 persons were treated, 3.99 per cent were very light cases, 20.39 per cent light, 44.90 per cent medium, 25.05 per cent intense, and 4.68 per cent very intense. There was 0.96 per cent unclassified. When we consider that in the majority of instances we did not classify these cases by hemoglobin percentage there may be some objection raised to any attempt at classification, but when we also note that our dispensary physicians had become familiar with the clinical types throughout their life in Porto Rico, and were keen at placing the cases in the class in which they belonged, it will be seen that the error, if there was any, was exceedingly slight. This we know from our own experience, where a series of several thousands were subjected to a hemoglobin examination at the beginning of the work. Our classification by hemoglobin percentage was as follows:

Between 60 per cent and normal, a light or very light case.

Between 30 and 60 per cent, a medium or moderate case.

Below 30 per cent, an intense or a very intense case.

The clinical estimate of the grade of the disease was as follows:

A light case: An individual, previously vigorous and energetic, gradually finds himself losing in strength and inclination to work, with symptoms of dyspepsia and, perhaps, a faint pallor. To his friends and neighbors he is "run down." To unfriendly eyes he is "lazy and good-for-nothing."

A moderate case: A moderately anemic individual, with minus activity of mind and body. The patient looks and feels definitely sick. There is no longer mere disinclination to work, but partial inability. He is pale, exertion brings on throbbing of arteries and palpitation of the heart; sudden changes of position, sudden dizziness. He is half narcotized, as it were.

An intense case: The patient has arrived at that stage when a fatal termination may occur at any time. Extreme pallor, edematous extremities, dilated heart, and so forth.[1]

On referring to the 5,490 cases of 1904, where the taking of hemoglobin percentages on admission was often practiced (upon which percentage the type of the disease was based), and comparing this result with the estimate of the case as established clinically in over 280,000 cases subsequently treated, it will be seen that, by the latter method, the seriousness of each case was rather apt to be under- than overestimated.

In whatever light we choose to view it we can see how sick a laboring class Porto Rico had. My own experience has led me to consider the hemoglobin percentage a fair estimate of laboring capacity where it is between 20 and 85 per cent, although it is wonderful to see the work attempted by an anemic laborer. Below 20 per cent he is usually hors de combat, and above 85 per cent speculation concerning his laboring capacity as affected by the worm he harbors is too uncertain. This means that the average anemic workingman in Porto Rico lost 50 per cent in working capacity from anemia.

From earliest colonial days this unrecognized disease has been responsible for the unjust charge of the full-blooded European that the Porto Rican laborer was lazy and indolent, and only after a tremendous cyclone, which threw the coffee worker upon his own resources, was the mask snatched from the face of one of the most pitiful situations known to medical history. When urged by planter, by insular government, by the American people, to arise and go to work, he laid down to die in droves, at last incapable of responding to even dire necessity.

Anemia in Porto Rico, influenced by the special conditions incident to the downfall of coffee, and by the thousand and one factors which go to weaken the resistance of a defenseless and poverty-stricken people to a chronic exhausting disease, deeply affects the laborer, the land owner, and the territory.

THE EFFECT OF UNCINARIASIS UPON THE LABORER.

1. *To reduce his earning capacity.*—Many times he is paid for the work he accomplishes in a day. This is eminently true of coffee picking, where he receives from 10 to 15 cents per almud, or conventional box full. Some planters have two sets of wages, one for a healthy man and another, much lower, for an anemic. Incidentally they state that they lose money on the anemic, even with his lower wage, but have not the heart to turn him off, and so retain him in the hope that he may be cured and swell the numbers of his no-too-numerous workers.

2. *To sap his scanty wage by the purchase of medicines and in some cases, by doctor's fees.*—The amount of patent blood restorers sold in Porto Rico in past years is astonishing. When finance here was at its lowest ebb, after the cyclone, this ghoulish industry saw its best days. Doctors could not possibly reach the sick rural population, had they even wanted to do so, for the municipal doctor has on an average 15,000 people to attend, often more. These were practically all indigent, and 70 per cent were more or less sick. They lived, not in towns or hamlets, but in every nook and cranny of the municipality, nine-tenths of whose population was distributed

throughout the rural districts, unapproachable by roads and generally reached only over breakneck trails. Over five visits a day to such sick was impossible, given a doctor's duties in the town proper, and only the few fortunate ones had a modest fee to tempt a physician's call. The rest had to depend upon the lying promises of patent medicines and charlatans.

3. *To clog his mentality and reduce his spirit.*—"Over all the varied symptoms with which the unfortunate jibaro, infected by uncinaria, is plagued, hangs the pall of a drowsy intellect, of a mind that has received a stunning blow. * * * There is a hypochondriacal, melancholy, hopeless expression, which, in severe cases, deepens to apparent dense stupidity, with indifference to surroundings, and lack of all ambition."[2]

Such people are unable to act on their own initiative, and have to be driven to work and told each thing separately several times before they understand.

4. *To prevent him from avoiding infection.*—The earnings of a family averaged, in 1904, according to Weyl, the expert of the Department of Commerce and Labor of the United States, considerably less than $100 a year, and there was work available upon only four days in the week. Nine months in the year the majority had no steady work, and during the other three months, or at the time of the coffee harvest, the whole family was employed and payment was made, in coffee plantations at least, according to amounts picked. Fifty per cent of a normal picking was 50 per cent lost directly from disease.

Should every cent of the laborer's earnings be spent for food, his ration would still be inadequate for his working necessities. In this way, shoes were an impossible luxury. His miserable physical and mental condition, lack of market from impassable roads, lack of beasts of burden with which to work, made cultivation of garden patches out of the question.

5. *To prevent his seeking employment elsewhere than in the coffee grove.*—The coffee laborer, who is sick with anemia, is not wanted on sugar plantations, where there is less chance of infection and better pay. Thus his infirmity peonizes him and binds him to the grove.

The effect of uncinariasis upon the planter.—1. If the roaming coffee picker could earn but a scant 50 per cent of what he should earn in health, the regularly employed, living under practically the same conditions, could not be expected to earn more. As a matter of fact, even with the ridiculous wage paid in 1904 (30 cents), the planter lost money in inefficient labor. In a visit made by me to a coffee plantation, about two years ago, so remote from the stations for the treatment of anemia that the laborers were nearly all uncured anemics, I was told by the planter that he was thoroughly discour-

aged, and was about to give up; that he had 1,800 acres of the best coffee land, much of which he could not afford to put under cultivation, owing to the miserably insufficient output of the part already cultivated, and that he calculated his loss from sick laborers at about 50 per cent.

It was then afternoon and the harvest time; the pickers were returning from the grove and depositing their day's collection in the mill. I stationed myself at the door and asked each one what his picking had amounted to on that day, having first established the normal amount which they should have picked per man. The average of some 200 laborers was 50 per cent short of what it should have been, or 2 almudes a day. The amount received for a box full, or almud, varies with the abundance of berries, but on that day was 12½ cents an almud.

So here were 200 people who in one day had lost $50 from a curable and preventable disease. Seeing these poor, rain-bedribbled, muddy, barefooted anemics, one wondered how in Heaven's name they ever brought in the coffee they had picked; and, as a matter of fact, some stated that they had to be helped in by stronger comrades. Of these pickers many were pointed out to me as regularly employed peons of the estate, and these were indistinguishable from the rest, as far as the degree of their anemia went. When the incentive to make as large a picking as possible was only able to produce 50 per cent of a healthy man's output, can we expect that these peons, working by the day and in the same physical condition, should yield more for a wage?

2. With all the peons he could afford to pay, a large part of his estate remained uncultivated, or, if all cultivated, it would be so poorly worked as to yield only a fraction of its normal output.

3. The ideal of the planter is to secure enough peons to almost handle the crop, leaving a minimum to be employed at harvest time, for such itinerant laborers have to be provided during two or three months with lodging, often with meals, and so forth. The larger the number hired at harvest time the greater the expense aside from the wage. In the presence of an anemic peon class no planter can make economic calculations on his crop.

4. There is at present a scarcity of labor in the coffee plantations. Many good laborers have left the plantation to seek employment in the sugar and tobacco fields where the pay is better. But the men who leave are the cured cases of anemia, who otherwise would not be acceptable to the sugar estates. The result is that the planter in the mountains has to pay a higher wage than before and still struggle with his anemics. This is a class that is rapidly disappearing, but the fact remains that it looks as though the coffee men would have to fight anemia to the bitter end and long after the scourge will have

ceased to become a serious menace to the success of the sugar and tobacco industries.

The effect of uncinariasis upon insular and municipal governments.—1. In a country where so large a percentage of the inhabitants live from hand to mouth, without a cent saved for emergencies, in the presence of a disease which palpably affected 70 per cent of the rural laborers and caused, in 1900, 12,000 deaths, the resources of that country are strained to provide for them. About one-half of the taxes are covered into the insular treasury for roads, education, and so forth. Local roads, street construction, and other purely municipal expenditures have to be provided by the municipality. Were this municipality to provide for the proper treatment of all their indigent sick, including expenditures for medicines, it would go irremediably bankrupt. As a matter of fact, the paltry sums appropriated for this purpose never met the situation. In many municipalities the proposals to furnish medicines for indigents were bid upon by local pharmacists and in a month or so the entire amount was spent for the fiscal year. Even these sums of money, not always wisely spent and not large, represented, nevertheless, a great effort on the part of the poor town.

2. The property values naturally depend indirectly on the output and, when the properties are only partially developed, the assessments fail to yield what they should.

3. The laborers employed by the insular government were apt to be the more anemic ones, the best having been absorbed by the plantations. In fact, these very sick were employed on roads at enormous expense, at the time when it was supposed that their condition resulted from starvation, and as a measure of relief to the poor. No one can ever know what percentage of these appropriations was lost from inefficient labor.

When all is said and done, it is plain that to permit the coffee industry to die out in Porto Rico is really unnecessary and very harmful. It is to many minds the crop of crops for the interior of Porto Rico, and its loss will ultimately spell ruin to sugar and tobacco, for these Antillan islands, bared of their trees, become subject to long droughts and torrential washouts. This has actually happened, apparently, on the south coast, where a three to six million dollar irrigation plant is seeking to save Guayama, Salinas, and Ponce sugar. The mountains to the north are scarred and bare, and, for lack of the roots of bushes and the shade of trees to store up and gradually deliver by hundreds of little streams an ample water supply to the rich coast lands below, one of the richest sugar districts on the island is threatened. All of this aside from other considerations already mentioned.

Uncinariasis affects the whole island, directly and indirectly, but it is the chief bane of the coffee industry. To solve the coffee problem, no plan is complete, nor would such a plan be successful, which takes no account of this medico-social problem.

In Weyl's report to the Department of Commerce and Labor of the United States on labor conditions in Porto Rico, in 1904, we find the following:

> One of the most important of all the factors influencing the condition of the laboring classes of the island is the disease of anemia. This disease, which mainly attacks the poor of the island, more, perhaps, than any single factor, impairs the industrial efficiency of the great mass of Porto Rican laborers. The economic importance of the disease can not be overestimated; * * * the disease is so widespread as to be considered practically universal. The effect upon the conditions of the laboring classes of Porto Rico of completely obliterating the disease of anemia would be almost incalculable. Many persons who are now too sick and weak to work would then be enabled to do so and the industrial efficiency, as it is affected by the muscular strength, the nervous energy, the physical endurance, and the intelligent direction of work of the people, would be vastly increased. An energetic movement with a view to the obliteration of the disease is probably the greatest single step which can be taken at the present time toward improving the industrial efficiency of the laboring classes of Porto Rico.

From 1904 to 1910, inclusive, there have been treated for their anemia, by a special service, 300,000 persons, in round numbers. This number will be much increased by adding the fruit of unofficial work, as follows:

1. *Cases treated by physicians not connected with the service.*—To-day there is hardly a physician who does not treat the anemic jibare with thymol. Many times this is done without a previous fecal examination, in spite of our protests, but inasmuch as 99 per cent of such cases are due to uncinariasis great good results therefrom.

2. *Cases treated by religious societies and medical missions.*—Their number is large and they contribute in a most practical way to the general work.

3. *Cases treated by charlatans.*—Remembering what has been said concerning the difficulty attached to reaching a doctor from the remote barrios of a municipality, is it any wonder that the more calculating jibares learn the simple technique of treatment and apply it extensively for a consideration? That this is by no means uncommon is seen by a little skillful questioning throughout these barrios. A vigorous war upon these interlopers has been carried on from the first, but it is hopeless to expect to catch them all.

4. *Cases treated by the family.*—The administration of thymol and salts for anemia is rapidly becoming a family remedy in certain parts, as quinine and calomel is in our South. Even some proprietors of estates are gingerly taking it up. Of course, this, too, is all

wrong, but what can be more natural? Theoretically it is hard to obtain drugs without a physician's order, but in practice it is by no means difficult.

5. *Cases treated by the officials of the anemia service in the intervals between appropriations to continue the work.*—On several occasions there was a hiatus between the ending of the fiscal year and the reestablishment of the anemia service. On one occasion the legislature was convoked in special session for the purpose of providing for the irrigation of the south coast and to reappropriate funds to continue the anemia work, which it had failed to do at the regular session. In these intervals our physicians kept their stations open and worked without pay, although their records were no longer kept as they had been before.

In addition to all this, there have been many thousand cases treated by the present sanitary service, which took over the work on July 1, 1910.

Hookworm disease probably gained its foothold in Porto Rico in 1530, nearly 400 years ago. In 1788 Fray Iñigo Abbad states that the jibaros had "the color and aspect of convalescents." How many years this color and aspect had been observable he does not say, but we can safely affirm that for 200 years Porto Rican anemia had been explained by the compound theory of improper food, tropical climate, and malaria.

To change the fixed belief of a people, the heritage of 200 years, was no easy matter. From 1899, when this anemia was first identified by the writer as ankylostomiasis, until 1904, when the real campaign against it began, was a period of hard work in propaganda and scientific study.

The result of the universal application of a specific remedy for this anemia has surpassed our most extravagant hopes. To-day a bad case of uncinariasis is rare, indeed, along the highways of Porto Rico, where before, in every town where the traveler halted, he was besieged by pitiful beggars in the last stages of the disease, unable to work, and driven by hunger to implore charity from passers-by. Few cases of moderate severity are seen, and, indeed, the color and aspect of the Porto Rican people can no longer be described as that of convalescents.

The mortality from anemia is but one-eighth of what it used to be. The total death rate has fallen from 42 per thousand, in 1899–1900, to about 22 per thousand, in this year, and only in the mountains, in those far-away barrios, unseen by traveler and even by the city-bred Porto Rican, does hookworm still stalk abroad, not, indeed, as it did before, for with the universal treatment of the disease came the universal education of the people, and to-day there is scarcely a jibaro

who does not know that no one need die of his old enemy "la anemia."

At the close of each year of work the commission has made it a feature of the annual report to publish letters which demonstrate the enthusiasm and earnestness of those who worked with us to secure our ends. Until 1907–8, our data had been secured from our physicians, who were really best fitted to judge of the results we were obtaining, but, in the last-named year, the municipal officials of 37 towns, in each of which stations had been working throughout the year, were called upon to express their opinion of the necessity for continuing the work. The mayor, voicing the sentiments of the council, and, in some instances, the town council by formal resolution, eloquently appealed for its continuance, citing the improvement in the health of the people, the reduction in mortality, and the saving on the municipal budget for medicines. Many stated that they would gladly bear part of the expense to keep up the work, nine passed resolutions calling upon the governor to convoke the legislature in special session to appropriate funds enough to proceed with the campaign, and practically all paid a tribute to the work that amply repaid its physicians for the thousands to whom they had administered treatment.

Thus we have the expressed approbation and support of the physician, and of the people through their municipal officials. We have a demonstration, eloquent, persistent, of the jibaro's faith in this new "theory" which brought him daily in throngs, over many a weary trail and without the slightest compunction, to our stations. We have the frank expression of the legislature, which, from year to year, has liberally supplied the necessary funds for the maintenance of the work, to a total of nearly $200,000. We have the earnest interest of all the governors of Porto Rico, beginning with Gov. Hunt, in 1904, who, together with the Hon. Régis H. Post, introduced the first appropriation to the present executive, Gov. George R. Colton, all of whom have, year after year, urged upon the legislature the absolute necessity for supporting this campaign.

In short, no class nor condition of people in Porto Rico, hardly an individual, doubts the necessity of fighting anemia and of paying out good money to do so.

Notwithstanding all this, when I began to prepare the paper which I was to deliver to-day, it seemed to me that to all of this testimony should be added that of the planter himself, who could perhaps say, with even more certainty, what these benefits have really amounted to. Accordingly, I addressed a circular letter to nearly 400 sugar, coffee, tobacco, and fruit growers, representing every municipality in the island.

Although there has not been sufficient time since they have been sent for me to have received answers from all, I give after each of the following questions the composite answer made by the 224 from whom replies have been received.

A few of these planters specified no percentage, but all save two express in general terms what the others express in figures.

Among those remaining some occasionally refrain from fixing a percentage in answering some one question. This is especially so of question 4, in which 65 remark simply that "the benefit received is incalculable," or "of course my profits rise with the cure of my peons," and so forth.

First question. What percentage of laborers who could perform a full day's work did you have on your estate in 1909?

Answer. 40. (Average from 178 planters.)

Second question. What percentage of efficiency for labor have your peons gained since they have been cured of their anemia?

Answer. 61.7. (Average from 193 planters.)

Third question. What percentage of anemic peons exist to-day on your plantation?

Answer. 17.5. (Average from 202 planters.)

Fourth question. Do you believe that by curing them your own profits would increase; and if so, by what per cent?

Answer. 40. (Average from 159 planters.)

More than half append to their answers the statement that the money spent in the anemia campaign was the best investment the legislature ever made, or that the campaign should be continued, or that the results were surprisingly satisfactory.

I believe that the sentiment of the planter is best expressed by the following letter (in answer to one of my own inclosing a copy of the paper which I am now presenting to you) from the president of the National Coffee Growers' Association of Porto Rico:

[Translated from the Spanish.]

PONCE, P. R., *July 15, 1912.*

DR. BAILEY K. ASHFORD.

San Juan, P. R.

MY DEAR SIR: In answer to your circular of last June and your communication of the 12th instant I desire to make the following observations:

I have carefully read your interesting work on the economic aspects of the campaign against the anemia of this island, and I do not find anything to add to it, nor do I believe that I should have to make any correction in it. You have said everything. The results of this campaign should not be viewed solely in the light of the notable reduction in mortality shown by the statistics, so far as they refer to uncinariasis, but in the return to the sociologic normal of the large masses which the disease had rendered useless for work, in the work these masses are now contributing to our ever-increasing production, in the number of human beings saved from beggary and the life of parasites, in the corresponding increase in our commerce, and in the general betterment of an important percentage of our people.

The shortness of time at my disposal deprives me of the pleasure of making a careful investigation concerning this matter in order to be able to respond to your questions with exactness. I am not able therefore to answer these questions with mathematical precision, but I can indeed assure you—and this every one here knows—that the laboring capacity of our workingmen has notably increased—to such a point indeed that an infinite number of laborers completely invalided by their anemia, and for this reason absent from their work in the plantations, are to-day performing work that can not be surpassed in any place.

There are two facts that speak with overwhelming eloquence for the value of the anemia campaign:

1. That our production of sugar has been raised from 70,000 to 300,000 tons; that that of tobacco has increased surprisingly; and that the coffee crops, with variations due to the rainfall, are now almost what they used to be before the cyclone of 1899. Moreover, there has not been any lack of personnel to handle the increased production.

2. That in spite of the great number of laborers who descend to the coast, attracted by the work of the sugar and tobacco plantations, they are not missed in the mountain districts of the interior, where coffee is cultivated and where the scourge of anemia was greatest.

In short, I believe that everyone here admits as a fact beyond discussion that the campaign against anemia has powerfully influenced the increase in the laboring capacity of our working people, those who have been treated being to-day as strong as the strongest. The important proposition now would be that government and planter should work together, each in his sphere of action, not only to prevent the disease from invaliding our country people as before, but to safeguard those who have been already cured against a reinfection in order that the fecund work which you and your confrères have done may not be rendered sterile.

With my best regards, I am, yours truly,

X. Mabiani.

When we confront this data with our estimate that 90 per cent of the rural population and some less of the towns were infected with *Necator Americanus* and that 70 per cent of these were more or less sick it will be seen that our estimate was not far from the truth.

We considered that we had to deal with about 800,000 infected at the beginning of our campaign, when the population was 950,000. Three hundred thousand were treated in the six years of existence of the special anemia service, during four years of which that service consisted of Porto Rican physicians under the superintendence of Dr. Pedro Gutierrez. From 100,000 to 200,000 more have received treatment to date which have not been included in our official statistics and 300,000 still require it. But of this 300,000 fully 200,000 are really light cases or simply worm carriers, leaving only about 100,000 who are palpably sick. The majority of those sick are in the hitherto inaccessible mountain barrios.

It is a natural temptation to figure out the millions saved per year to employer and employed; the value of lives which would have otherwise been lost; the impetus which agricultural life has received by raising the homoglobin of the laboring poor of Porto Rico, but

I will leave that to each one who hears or reads this narrative to estimate for himself.

Enough has been said to bring to the consciousness of everyone that scientific medicine has made a whole people 50 per cent better physically than they were before and has played a winning card in bringing about a 400 per cent increase in Porto Rico's commerce.

[1] Uncinariasis in Porto Rico: S. Doc. No. 808, pp. 40, 41: Ashford and Gutierrey. Government Printing Office, Washington, 1911.

[2] Op. cit., pp. 89, 90.

THE ECONOMIC ASPECTS OF HOOKWORM DISEASE IN THE UNITED STATES.

Ch. Wardell Stiles, professor of zoology, United States Public Health Service.

Our southern vital statistics, especially for rural communities, are so imperfect that an exact, mathematical, and scientific consideration of the hookworm death rate can not be submitted. We may, however, be permitted to make estimates—or "guesses," if you prefer to call them such—and if these are kept within conservative and minimum limits they are more or less justified, especially in so far as they give to the person not directly connected with the hookworm work at least a slight, though imperfect, idea of the problem before us.

The American mind is rather disposed to grasp a mathematical estimate more readily than a description of conditions, and, playing up to the American tendency to express matters in figures, with a dollar mark before them, I will be so rash as to attempt first of all a minimum estimate of our financial losses caused by hookworm disease.

Several years ago, when pressed by a very keen, far-sighted American publisher for an estimate as to the number of cases of hookworm infection in the country, I placed the figure at not less than 2,000,000. Subsequent events have shown that this estimate is conservative.

With conservatism we may, I believe, assume that the potential loss to these 2,000,000 of people averages at least $1 per week or say $50 per year per head. This would give us a total loss estimated at $100,000,000 per year. Cutting this estimate in half, for sake of policy, I believe we are justified in saying that hookworm disease is costing this country at least $50,000,000 per year.

Permit me to say very frankly that this estimate is made simply and solely in order to satisfy that peculiarity of the American temperament which seemingly is much readier to grasp a financial than a humanitarian proposition.

Let us now turn to another line of consideration.

The various influences of hookworm disease may vary considerably according to whether the infection is preeminently a surface infection as on farms, or a subsurface infection, as in mines. In the

latter case (the mines), it is chiefly the adult males of a given portion of the population that suffer primarily; in the former case (the farms), it is chiefly the children of school age and the women of child-bearing age upon whom the real brunt of the effects of the disease falls.

For our States the mine infection is by no means to be ignored, but it is the surface infection that is of the greater importance. This fact shows us that despite the injury that may be done to our adult males, it is chiefly our children of school age and the child-bearing females who are the prime factors for our consideration to-day.

If we expect that, by visiting our southern cities or by studying the present imperfect vital statistics of our registration units in the South, we are going to obtain even a fragmentary conception of the hookworm situation, we are most superlatively in error. The best we can do at present is to take some specific examples of various types, ask you to multiply them mentally by 10 to 100,000, according to the circumstances, and then leave the general results to your imagination, with, however, the caution that it is utterly impossible for any person to gain a true picture of the subject without actual field experience in the open country.

First, let me take two examples of public schools visited since September 1, 1912.

At X—— there is a white school with about 60 pupils. The teacher is an energetic, ambitious, sensible man. He begged me to visit his school because he was conscious of the fact that he was not succeeding in getting these children to absorb as much education as they should. It needed only a glance at the pupils to see where the trouble was. If there was a single pupil there who did not have hookworm disease, the fact escaped my attention. This man was endeavoring to teach 60 anemic, half-starved brains, belonging to children, a number of whom were only 20 to 50 to 80 per cent of normal as respects their hemoglobin.

At Y—— there is a school in which I saw 29 pupils, all but one or two of whom appeared to be clinically well-marked cases of hookworm disease. The teacher naively informed me that there were a number of pupils not at school that day as they were sick. Two of them I saw at their homes the next day and their hemoglobin was about 20 to 30 per cent of normal.

These schools at X—— and at Y—— are not great exceptions, though I would not even intimate that all schools are as badly off as they. Hundreds of our schools are, however, just as bad as these, and from such extreme conditions the infection varies in degree to a point where the inefficiency is decreased probably by only 1 to 10 per cent.

By this time you doubtless foresee the important point I wish to make, namely, that much illiteracy or near-illiteracy in our infected

States is due directly to hookworm disease, that thousands of children are seriously handicapped and inhibited in their education because of this disease, and that this effect upon their education will follow them throughout life, rendering them in general less efficient producers, less enlightened men and women, less trustworthy and less useful citizens. This economic aspect of hookworm disease can not be reduced to the dollars and cents basis—except at election time.

The presence of any large number of persons, such as the pupils just described, in any district, and especially in a State with a large negro population, of necessity prevents that State from attaining as high a standard as it might attain if hookworm disease were not present.

Let us turn now to a consideration of certain phases of hookworm disease in reference to women.

I show you a picture of a white family consisting of a father, a mother, and five children. The point that this is a pauper family does not interest us at present. All these seven persons have hookworm disease, and five other children—not shown in the picture—died in consequence, directly or indirectly, of hookworm disease, if my information is correct. Let us put sentiment aside and see what the facts mean to this mother:

This woman has been through 90 months of pregnancy, 10 confinements, and practically 240 months of convalescence. In addition, she has nursed 10 infants, has kept house, and attempted to raise 10 children, sitting up with them at night when they were sick; she has watched five of her children die and has had five funerals in her family. No wonder she is prematurely old. One half of her entire maternal life has gone for naught, simply because her husband did not provide a sanitary privy for his family. Multiply this case, please, by thousands, and then attempt to imagine what hookworm disease means as an economic factor to the country in the constant drain upon the health of the mothers and upon the happiness and development of the homes. Here again we have an important economic aspect of the subject that calls for serious consideration.

I have in mind a girl 20 years old, a factory girl, who was able to work only half time. She was a case of absolute amenorrhea and always had been. Her mother told me that seven physicians had treated her but had not helped her. Her father told me that he had been kept a poor man because of the bills for medical service and medicine, incurred because of this girl. She took three doses of thymol, expelled her hookworms, and became a healthy woman, who now makes regular time at the mill, and is the chief support of an invalid father and a broken-down mother. There are many physicians in the country who are correctly recognizing and successfully treating hookworm disease, but it is equally true that there are many

practitioners who either can not or do not recognize it, and who are collecting from poor people medical fees for service not properly performed. The 20-year-old girl mentioned, with her financially impoverished family, may be taken as a general example of numerous cases that I have seen.

I am next thinking of a woman who has been pregnant six times, if I recall correctly, but who has never had the strength to carry a single child to full term. An unusually intelligent physician who has known of this case for many years reduces the trouble to the fact that this woman is a typical extreme case of hookworm disease.

The real accumulative effects of hookworm disease in this country seem to me to fall more heavily upon the women of child-bearing age than upon any other portion of our population, and a fair examination into conditions would make it very difficult for us to escape the conclusion that our women, in the infected area, age more rapidly than do the corresponding women of our noninfected areas. This too-rapid aging of our home makers is a matter of great economic importance, for it tends to the lowering of the standards of the infected homes and, hence, the standards of the infected localities.

With a home standard lowered by disease and with a school machinery handicapped by lowered hemoglobin and high verminous intoxication in its pupils, and even in many of its teachers, it is not strange that many localities—in fact, many counties—are economically backward. That hookworm disease is not the only factor that comes into consideration I take as self-understood, but that it is the chief handicap of hundreds of thousands of Americans in certain counties I see no valid reason to doubt.

In our infected districts we have many different points of view regarding religion, politics, economics, and various other matters, but I believe there is at least one conclusion upon which we can all agree, namely, that there is a scarcity of efficient labor, both on our farms and in our factories.

Since it has been demonstrated that hookworm disease is present and even common, both on the farms and in the factories in many portions of a number of different States—since, further, hookworm disease lowers the condition of the blood and hence the efficiency of infected persons, it is not unreasonable to conclude that hookworm disease is one of the important factors in the scarcity of efficient labor.

It would be an easy matter to take you to localities where at least half of the farm laborers or half of the factory hands show hookworm infection, with resulting anemia, enlarged hearts, weakened bodies, and lowered mentality. You and I may differ as to the importance of the rôle played by the hookworms in these lowered factors that go to make life happy, but if you wish to dispute the claim that hookworm

disease is one of the most important factors in explaining our scarcity of efficient labor in the infected districts. I should like to argue the matter with you in the factories and farms employing hookworm labor rather than in a city in which hookworm cases are rarely seen.

A scarcity of efficient labor, a lowered standard of the home, an inhibited mental development, an increased illiteracy, a tendency to wear out before it is time, especially upon the part of the mother—all of these are factors that are distinctly favorable to the development of child labor—without, of course, being the only factors involved in this unnatural economic monstrosity; and as I see families going from the infected farms to the mills, often with broken-down mothers, often with inefficient and illiterate fathers, I am not at all surprised to see the amount of child labor that exists in the factories of our infected districts; in fact, the surprising thing to me is that child labor is not even more common and more extreme than it is now.

One word as to the relation of hookworm disease to the subject of immigration, and I will close. Because of the undeveloped condition of certain areas, and because of the scarcity of efficient labor, there is a more or less widespread demand for immigration. That this demand should receive support from the commercial organizations is not surprising; but I believe there is another legitimate point of view, namely, first, in our hookworm-infected districts our problems are complicated enough already without introducing among us a large number of foreign laborers who do not speak our language or know our customs; and, secondly, if we will improve our sanitary conditions and thereby reduce our diseases and deaths, the natural increase in our own people, combined with the increased efficiency resulting from better health, will meet the labor demand. We do not need more immigrants half so much as we need more privies to prevent the spread of hookworm disease and of other soil-pollution infections.

DISCUSSION.

Wickliffe Rose, administrative secretary of the Rockefeller Sanitary Commission: In the light of our present knowledge the economic significance of hookworm disease can not be stated in definite terms; but when one lets his imagination play upon the facts which we do have, one is driven to the conviction that the economic loss resulting from the disease is enormous.

Dr. Stiles has given you specific examples of economic loss resulting from the disease in the States; Dr. Ashford has presented an impressive array of facts from his own experience and the experience of the employers of labor in Porto Rico. When I traveled over that island with Dr. Ashford, I learned that the physically sound coffee

picker was picking from 500 to 600 measures of coffee per day. Scores of anemics told me they could pick only from 100 to 250 measures per day. When I had thus seen what the disease meant for the individual worker and had visited a large number of plantations where I saw 90 per cent of the laborers infected, I was prepared to understand when the managers of these estates told me that the disease had reduced the efficiency of their labor to from 35 to 50 per cent. When I had seen what it meant for one plantation and had seen the prevalence and severity of the disease over the island, the conviction was borne in upon me that to that one little island, with its 3,600 square miles of territory and its 1,000,000 of people, the economic loss due to this disease has been and is enormous.

With such standard of measurement in mind we can begin to comprehend something of the economic significance of the disease in the large, when we let our imaginations play upon the wide distribution of the infection and the degree of infection in the infected areas.

Through the good offices of the Department of State, the Rockefeller Sanitary Commission has been able to get official reports on the prevalence and degree of infection in practically all countries. These reports, as summarized in the commission's publication No. 6, show that hookworm infection belts the globe in a zone about 66° wide, extending from about parallel 36° north to about parallel 30° south; that practically all countries lying within this zone are infected; that 46 countries in this zone outside the United States, comprising an area of about 14,464,158 square miles, and having a population of about 919,858,243 people, report a prevalent infection; that of the total population of the globe—about 1,600,000,000 people in round numbers—about 940,000,000 live in countries where hookworm disease is prevalent.

In many of these countries the disease is extremely prevalent; in many cases quite as severe as in Porto Rico. The reports referred to above estimate that of the whole population of Colombia living between sea level and 3,000 feet above, 90 per cent are infected; that of the total population of British Guiana 50 per cent are infected, the percentage of infection among the laborers on the sugar estates being much greater; that in Dutch Guiana the infection on many plantations runs as high as 90 per cent; that over a thousand microscopic examinations in French Guiana showed an infection of 35 per cent among a local population, 50 per cent among soldiers, and from 50 to 88 per cent among prisoners; that in Egypt general estimate places the infection at 50 per cent of the laboring population; that 50 per cent of the coolie laborers on sugar and tea estates in Natal are infected, with the disease spreading among natives and Europeans; that on many plantations in Ceylon the infection runs as high as 90 per

cent; that of the 300,000,000 of people of India, 60 to 80 out of every 100 harbor the parasite; that on rubber plantations in the Malay States, the infection runs from 47 to 74 per cent; that the southern two-thirds of the Chinese Empire is involved with the infection in many places in the Yang-tse Valley, running as high as 70 to 76 per cent among the farming population; that of the entire population of American Samoa, about 70 per cent are infected.

Seeing what the disease means in terms of working efficiency for the individual coffee picker in Porto Rico, seeing what it means for the owner of the coffee plantation in Porto Rico, seeing with reasonable definiteness what it means economically for that island as a whole, we can understand in general terms at least what it must mean to the countries giving us these reports. Dr. William M. McDonald reports that the disease is "sapping the life and energy of the population of Antigua." Dr. E. Brimont says: "The disease has greatly retarded the development of French Guiana." The report from British Guiana says: "The economic loss due to hookworm disease on the sugar estates is heavy. On one estate, where the laborers were treated on a large scale, the manager reported that the working power of the gangs had increased 100 per cent." Dr. L. F. McDonald, of Queensland, reporting conditions in the Johnston River district, says that "It is sucking the heart's blood of the whole community." The right honorable the Earl of Crew, Secretary of State for the Colonies, in his dispatch on this subject to the governor of Ceylon, says: "Having considered the reports from the several colonies, with the observations of the committee upon them, I recognize that the loss of labor caused by the prevalence of ancylostomiasis is very serious and effects prejudicially not only the employers of labor, but the community at large. Not only is there serious loss of life, direct and indirect, but also through the invaliding of laborers the charges for hospital and pauper expenditures are largely increased."

In closing I repeat: We can not at present state in definite economic terms what hookworm disease signifies; it is only by letting the imagination play upon a summary of such definite facts as we do have that we get some appreciation of what the disease must mean for a country like India, with its 300,000,000 of people and from 60 to 80 per cent of them infected, or of what it means for civilization, with more than half the population of the globe living in countries where the infection is prevalent.

Dr. Claude A. Smith, Atlanta: There is an optimistic side to the health and economic aspect of hookworm disease in the South United States. It is true that as the stunted hookworm patient reaches the age of 15 years the parents dress it as an adult, and additional infection rarely follows on account of protection of shoes. As a result in

eight years all infection has died out and the patient reaches delayed maturity with a slight loss of earning capacity.

This is one of the means of preventing continued ill health and economic loss. The extensive work being done by Rockefeller Commission under Dr. Stiles and other measures cause us in the South to have an optimistic view of the hookworm situation.

Dr. Ashford: I desire to call attention to the palpable loss suffered by the anemic laborer who earns but 25 cents a day, while his healthy companions earn 50 cents. This may occur through the reduction of the wage, on account of his physical inefficiency, or it may occur through incapacity from disease when he is paid only for amount of work accomplished.

In reply to Dr. ——— I would inform him that the anemia of uncinariasis is a pure secondary anemia, with a 0.50 color index, absence of leucocytosis, microcytosis, polychromatophilie, and poikilocytosis. One of the characteristics of a medium or light case is eosinophilia. Usually this lies between 10 and 20 per cent. It reaches 68 per cent in one of my cases, but in severe cases it is as likely as not to be conspicuous by its absence. When absent the prognosis is affected unfavorably. But in these severe cases one frequently sees this secondary anemia take on a primary form with high color index, macrocylosis, etc.

Some of the phenomenally low hemoglobin readings may be due to increased volume of the blood by hydremia, as first brought out by the Boycott and Haldane of England. This factor, however, is not of great consequence in many cases.

OCCUPATIONAL BRASS POISONING: BRASS FOUNDER'S AGUE.

Dr. Emery R. Hayhurst, Chicago, Ill.

INTRODUCTION AND DEFINITIONS.

1. *The alloys.*—Brass is an alloy composed of copper and zinc. Fine brass or red brass contains 2 parts of copper and 1 part of zinc. However, as these two metals combine in practically all proportions, many alloys are possible. As zinc is by far the cheaper of the two component metals, its percentage in the alloy is likely to be much increased, until a so-called yellow brass is produced, in which the zinc component may be from 40 to 50 per cent. This the workmen style "cheap yellow brass."

Bronze is an alloy consisting of copper and tin. Usually the copper component is about 9 parts to 1 part tin. In the industry, however, red brass is very often styled bronze, although zinc is the other

component instead of tin. It is only rarely that these two or three metals are used exclusively in the particular alloy to be made, but, for the purpose of conveying certain physical properties to the casting, certain other metals are added, such as lead, aluminum, phosphorus, nickel, and antimony. There are some threescore of these various compositions which are well known and are made up for certain purposes (brass, bronze, German silver, aluminum alloys, type metal, and so forth).

In the usual foundry practice, these various alloys are not made by putting in certain proportions of the various metals, but, as a rule, a large percentage, from one-third to one-half, on the average, of scrap brass, copper, and bronze, consisting of all sorts and compositions of metal gathered up usually by junk dealers, is melted down, and then a little of the proper copper, zinc, or nickel ingot added to arrive at an approximate composition. In fact a large amount of the so-called virgin copper, zinc, and other metals which are used, is bought from refiners of scrap metal, and the composition is very uncertain. Certain foundries make a specialty of yellow brass castings, others of red brass or bronze castings, others of German silver, and so forth, while the refiners are concerned with the handling of all of these metals and usually with a large amount of lead.

Consequently, the brass-manufacturing industry, or, more properly, the nonferruginous metal-working trade, is engaged in the handling of large amounts of copper, zinc, and tin, while it must not be overlooked that lead, antimony, nickel, phosphorus, arsenic, and cyanide compounds sometimes enter into these industries, as well as the handling of concentrated and fuming acids (muriatic, sulphuric, nitric, and hydrofluoric).

Finally scrap metal, old boiler tubes, and so forth, by the action of air and moisture, may be covered with more or less poisonous oxides and carbonates, by which ignorant workmen may be poisoned both through handling and breathing the metallic dusts. In addition to the metals above named, as entering into the composition of various brass alloys, the salts with which they are combined to a limited extent require some notice, such as the oxides, the sulphides, the sulphates, silicates, and nitrates.

2. *Pseudo-brass poisoning.*—Direct toxic effects due to any of these alloys of zinc, copper, and so forth, in the cold metallic state, when these come in contact with the tissues of the body, are of mechanical traumatic significance only, with whatever possibilities subsequent infection may add. As is well known, also, the salts of some of these metals have a local effect which is astringent to caustic. The inhalation of dust of any of these alloys, as, for instance, among polishers, buffers, and grinders, in the industry, does not produce the symptom complex known as "brass founder's ague," which is

to be described shortly. An investigation made by the Illinois Commission on Occupational Diseases,[1] 1910, among some 2,000 brass polishers and buffers, failed to discover any affections peculiar to brass dust itself, nor did it appear to be any more harmful than iron dust to iron workers, or stone dust to masons and stonecutters. It is true that these workers suffer from chronic bronchitis in proportion to their exposure, and rapidly develop respiratory affections. According to Lehmann and Saito,[2] the great bulk of inspired dust finds its way into the stomach, not into the lungs, as has been confidently assumed. Obviously, inhaled dusts are collected in the upper respiratory passages, and either discharged directly therefrom, or swallowed, while less than a quarter reaches the lungs. This would be particularly true of these heavier metallic dusts.

The dusts from alloys rich in copper generally produce in workers green-stained hair, a greenish deposit on the teeth and gums, and a green tint to the perspiration, which may persist briefly even after a thorough bath, but all of these are without direct effects upon the health. Such findings are much more pronounced among copper workers than brass workers. Literature teems with references to the relative harmlessness of copper upon the human organism. It has been found accumulated in all the organs of the body, and even in the bones of former copper workers, which have shown a green discoloration, when later removed from graves. About 75 coppersmiths interviewed in Chicago were found to be uniformly healthy. Many of these were old men who had been at the trade from 30 to 50 years. This agrees with the observations of others.

" Brass itch " is a rather common condition among brass polishers and is due to the slight irritation of brass dust, combined with habits of uncleanliness, and is more prevalent in hot weather. Brass foundrymen, however, are singularly free from these green discolorations of hair, teeth, and perspiration, for the obvious reason that they are very little exposed to brass dusts.

3. *Limitation of brass poisoning.*—Brass poisoning may then be narrowed down, even in the industries, to those exposed to the inhalation of fumes arising from molten brass within the brass foundry. Hence the affliction brass poisoning is unknown outside of the industry. Brass, in any condition of temperature short of that of the recent vaporous state of its components, produces no intoxication peculiar to itself.

4. *Brass founder's ague* (brass chills, Giessfieber, Staubfieber, fievre des fondeurs. The workmen use cruder terms, such as " the shakes," " smelters' snakes," and " zinc chills ").—This is the theme of interest in occupational brass poisoning. Without question it is a symptom complex peculiar to the human being. Numerous investigators have failed to produce the ague features in lower animals by inhalation of

brass fumes, intratracheal insufflations, ingestions, instillations, or injections.

Brass founder's ague may be defined as an acute malarialike syndrome of chill, fever (sometimes), and sweat, appearing a few hours after the inhalation, for a few minutes or longer, of the vapors or fumes arising from molten brass or from the fumes of pure zinc alone,[3] affecting only or mostly those unaccustomed to such exposure. It is further characterized by the development of a form of temporary immunity and absence of immediate serious or fatal consequences, a lack of definite pathology, and the probability of the development of nonresistance to secondary affections which account for the increase in the morbidity and mortality of persons so exposed.

The symptoms, which appear usually several hours after the pouring of brass or after an exposure to the metallic smoke arising from the metal, set in with a dry, parched throat, an irritating and unproductive cough, a feeling of constriction in the chest, lassitude, more or less anorexia, followed occasionally by nausea and sometimes emesis. Within one to four hours chilly sensations begin to be noticeable, while a slight dull headache develops. The workman usually lies down or takes to his bed. The chills rapidly increase into a distinct rigor, which may last from a half to two or three hours. No amount of external heat or blankets appears to lessen the rigor. Also there is a great desire to imbibe hot drinks and stimulants. Accompanying the chills and rigor there are usually muscular cramps and sharp joint pains. The victim feels that he is deathly sick. These symptoms end almost by crisis and are followed at once by a most profuse perspiration, while the prostration lasts for several hours longer. In many cases there is a distinct rise in temperature during and following the chills, but it is not constant and may be subnormal. It does not usually mount high. Following the stage of perspiration the victim, quite prostrated, falls into a deep and restful sleep, from which he awakens with no remaining symptoms of his recent experience other than a little exhaustion, perhaps a metallic taste in his mouth, and a temporary loathing of food. The entire attack usually lasts from 5 to 20 hours, seldom longer.

During the chill the pulse is small and rapid (120 to 130 per minute). The respiratory rate is not much affected. The blood findings during and after a chill have been reported by most investigators as entirely normal, although some have found a slight leukocytosis. The urine, after a severe chill, invariably shows albumen and casts which clear up within a day or so. In 1906 J. Sigel[4] proved the presence of zinc in the urine. This has since been verified by Lehmann, Arnstein, and others. Sigel also proved the absence of carbon-monoxid hemoglobin, as an etiologic factor, by spectroscopic examination of the blood. Weyl[5] comments on associated splenic enlargement.

There are many conditions which seem to influence the onset and severity of brass chills. The newer workmen, or those who have returned to work after a week's vacation, perhaps only after a day or so off, as over Sunday, are the most liable. Unless the exposure to the metallic smoke and vapors has been unduly severe, the workman continues at his vocation all day without noticing untoward health effects. It is usually after leaving the workshop at night that the sickness comes on. Many state that as soon as the cold outside air strikes them the chill is inaugurated. Hence the chills are far more common in the winter than in the summer. Many state that while riding home in the street cars, or perhaps on removing the clothes to go to bed in the evening, after a previous period of indisposition, the chill begins. The men claim that it is because they breathe more vapors in the winter than in the summer that chills are much more frequent in this season. This is because, in an endeavor to keep warm while at work and to keep the furnaces and molds from "chilling," the windows, doors, and skylights are kept practically closed: hence the fumes fail to escape through their usual routes of ventilation, as they do in the summer season.

Brass man's ague occurs almost exclusively among workers in brass foundries, but also in foundries in which zinc, alone or alloyed, is poured. In Illinois the only process in vogue of reducing crude ores to recover the zinc is one of volatilizing the zinc in huge smelters. Here an investigation showed that the men working around the smelters occasionally suffered from zinc chills, or "the shakes," as they were wont to call them. They are not as much exposed to the metallic fumes, however, as men who work in brass foundries. Brass chills do not occur in iron foundries nor in bronze foundries. Neither do they occur among galvanizers, the reason being obvious that in this latter process the zinc is only melted and is not heated above its point of volatilization. The method of alloying is of great influence, as the frequency of the chill, other conditions remaining the same, is in almost direct ratio to the percentage of zinc contained in the alloy.

About 70 to 80 per cent only of workmen seem susceptible to the vapors from brass and experience the chills. Hence some natural immunity seems to exist. Also a tolerance occurs in about 70 to 75 per cent of workmen who work steadily at the trade. A further 20 to 25 per cent sicken more or less regularly, but usually not severely. Only in very rare cases do these attacks occur so continually that a change of occupation is necessary. All factors which tend to lower natural vitality are predisposing to brass chills, especially alcoholism, poor quality of food, such as is consumed by a large proportion of the foreign workmen, irregular hours, and excesses of all kinds. In addition, weak, anemic individuals, young

persons, and women are more subject to brass chills than are robust individuals.

According to Simon [6] brass founder's ague is only an acute expression of a chronic malady, and one which rarely or never comes within the range or experience of practicing physicians. This question of chronicity is still a disputed point.

5. *Health of brass founders.*—"The molders consider the fever so commonplace and matter of course—only a few having been exempt and many having had it as much as one hundred times and more—that they do not go or send to the physician on account of same. At all events, physicians on this account have rarely had the opportunity of observing brass-founder's ague." Weyl.[7]

According to Simon [6] the situation is the same in England, and we have found it to be similar in Chicago.[8]

In addition to brass-founder's ague, respiratory diseases are very common (chronic bronchitis and pulmonary tuberculosis), while older workmen invariably complain of gastro-intestinal symptoms, such as chronic dyspepsia, biliary trouble, occasionally gallstones; often they are slightly icteroid. Constipation is the rule among them, and hemorrhoids are a common complaint. Pyorrhea alveolaris and carious teeth are common. The frequency of anemia, ill nourishment, and emaciation has long been cited as charácteristic of older brass molders.

The inducement to alcoholism among the workmen is great because of the chonic pharyngeal and laryngeal irritation from which they suffer. Most of the workmen resort to whisky, although only a few declare that it is antidotal. It is, unfortunately, a traditional remedy. There is no proof of its beneficial effects.

According to Tatham:[9]

> They sustain a mortality from phthisis which is in excess of that of occupied males by 50 per cent, whilst they die more rapidly than the average from diseases of the nervous, urinary, and respiratory systems.

Our investigations in Chicago in 1910, although not statistical upon this point, discovered a goodly number of young and middle-aged men invalidated by the ravages of consumption.

> If more proof were wanting of the unhealthiness of brass casters it would be afforded by the fact that a few years ago, though there were 1,200 casters in Birmingham, there were not more than 10 over 60 years of age, and, in connection with the superanuation fund of the Amalgamated Brass-Workers' Association from which casters could at the age of 55 derive benefit, it is an appalling fact that there were only three men * * * enjoying this benefit. (Simon.)

Practically only young men are found to be employed in the industry in Chicago. Employers gave as a reason for this that the older men (those over 40) became too slow for the work. The workmen

themselves claimed that they were gradually incapacitated from the inhalation of brass fumes, combined with the strain of piecework. By no means the same condition was found to exist among iron founders, who were engaged in the same identical processes. As is well known, the latter continue at their trade until they reach a fair old age.

BIBLIOGRAPHY.

Although the literature on the entire subject of brass founder's ague is very scarce, it is not my intention to enter upon more than a brief summary of it here. The affection was confused with malaria until the year 1830, when Thackrah,[10] in England, first described it as a separate affection peculiar to brass workers. In 1845 it was recognized and described by Blaudet,[11] in France. In 1858 Greenhow,[12] in England, on the basis of his researches, came to the conclusion that "brass pourers and doubtless all workmen who deal with zinc vapors are easily attacked with a disease similar to an intermittent fever of irregular type." In Germany Schnitzer[13] was the first to call special attention to brass chills in 1862. In 1906 J. Sigel,[4] in Wurttemberg, Germany, sums up the entire literature concerning this peculiar malady and adds the results of his own investigation. In America a few articles have appeared in recent years, usually reports of individual cases, among them being one by Moyer and Lavin,[14] of Chicago, in 1904; also one by Pietrowiecz[15] in 1904. The disease, as well as chronic symptoms of brass workers, is also commented upon by George M. Kober,[16] of the President's Home Commission, 1908.

Recent literature deals particularly with the experimental side of this peculiar malady, and the investigations of Lehmann,[3] Arnstein,[17] and Kisskalt[18] have thrown considerable light upon its nature.

ETIOLOGY.

The question of the exact cause of the aguelike symptoms seen among those exposed to brass fumes has been a matter of dispute since the time of Thackrah, some authors claiming it to be an expression of acute copper poisoning, others a zinc intoxication, others arsenical poisoning,[19] and still others have commented on the presence of lead, cadmium, and so forth, in the fumes. The question is a difficult one, because of the number of contaminating metals and impurities encountered in the process of manufacturing brass.

The volatilization of the metals in making brass is accompanied by a display of blue-green flames, scintillating sparks, and marked deflagration, especially of the zinc component. A white smoke arises above the metals, out of which small snowlike flakes sublime.

It is this whitish smoke and its sublimation products that are the cause of brass chills. Many analyses of this smoke and its products have been made, but no two authorities agree on the same findings, as might be expected from the inconstant composition of the alloys producing it. A typical analysis taken from Dangerous Trades, by Oliver, 1902, page 456, is as follows:

Organic matter	39.42
Oxid of zinc	28.82
Oxid of iron	2.78
Copper	1.71
Silicates	9.14
Moisture	9.64
Other matter	8.49
	100.00

Analysis of a similar specimen made for the Illinois Commission on Occupational Diseases [1] gave—

Zinc	44.9
Lead	.8

Others have reported the presence of cadmium, nickel, sulphur, traces of arsenic, phosphorus, and other metals and acids.

Although zinc has always been held the metal chiefly to blame for brass chills, its necessary combination with copper has been stoutly maintained up to 1905, when Sigel [4] first showed brass chills occurring in foundries where no copper nor iron could be demonstrated in the sublimation product. Sigel came to the conclusion that the chills were due to the entrance into the system of metallic zinc in the form of zinc dust and in statu nascendi.

In the fall of 1910 I found that so-called zinc chills existed among the zinc smelters of La Salle County,[1] Ill. The raw ore used consists of zinc blende (sulphide of zinc). These ores contain no copper or arsenic and only traces of iron, lead, manganese, and magnesium; 31 per cent of sulphur is present, as well as oxids and silicates, leaving less than 1 per cent of undetermined matter. However, neither sulphur, silicates nor any of the other metals present are known to produce a chill, fever, and sweat syndrome.

Lehmann [3] was the first to succeed in proving that the syndrome could be produced in man by burning chemically pure zinc. He further concludes that the affection is a direct or indirect zinc poisoning:

> According to the very small traces of zinc, which appear in the urine, to the symptom complex and to the sudden cessation of the phenomena, the idea seems acceptable that a resorption of the cell contents (bacterial or epitherial), destroyed or changed by zinc, in the respiratory tract, may be the cause of the peculiar sickness. A complication of intoxication with an infection through the entrance of living bacteria is imaginable in the more severe cases but certainly only as an exception. Zinc is inhaled only as zinc oxid, not as zinc vapor.

Recently nearly the same symptom complex has been observed in the case of the inhalation of the fumes of other metals, Armit[20] finding a similar syndrome in the case of the inhalation of nickel-carbonyl, the gas formed when nickel volatilizes, also in the case of iron-carbonyl and cobalt fumes. Very little is known as to the actual inhalation of copper fumes, since, like nickel, its boiling point is very high. There is great likelihood, however, that the severe brass chills which workmen suffer in making German silver where it is necessary to fuse nickel (about 1,600° C., which is above the boiling point of copper by 200° or 300°) are due as much to inhalation of copper fumes as to those of the associated zinc. Hansen,[21] a metallurgical engineer, cites some peculiar effects not unlike those due to zinc, which he attributes to copper fumes produced in an electrolytical process. When we consider the relatively low boiling point of zinc, compared to that of all the other metals with which it is alloyed, it is easy to see why these symptoms have been so closely associated with zinc and not, at least in the industries, observed in connection with other metals. Boilings points: Zinc, 830° C.; copper, 1,300° C.; lead, 1,450 to 1,600° C.; tin, 1,600° C.; nickel, iron, and steel, all over 1,600° C. Melting points: Tin, 232° C.; lead, 327° C.; zinc, 419° C.; copper, 1,080° C.; nickel and iron, about 1,500° C. Brass itself melts at about 1,000° C. Hence it is seen that, with the exception of mercury, whose boiling point is 357° C., but the dangers from the vapors of which are well known, zinc is the only metal whose boiling point is commonly reached in the industries.

Kisskalt,[18] who has been impressed by the rise in temperature, occasionally observed in the brass-ague syndrome, has looked up the literature carefully in regard to other metals which have been inhaled, ingested, and injected, and notes significant analogies. After a series of experiment upon rabbits, he concludes as follows:

> 1. Subcutaneous injections of zinc salts will produce fever. This may account for the same in brass founder's ague. 2. Inhalation of mercury often causes fever in man and animals, as well as pronounced respiratory symptoms. 3. Also other heavy metals produce the phenomena of brass founder's ague by inhalation. Vapors of heavy metals inhaled produce more similar symptoms than when taken up by other routes.

At another point in his article he makes the following interesting observation:

> For a long time it was considered that fever was produced by bacteria only; then it was found foreign proteins had the same effect; now heavy metals come to be added thereto. The effects of all seem to be the same. Heavy metals produce proteid precipitation, and so "denatured" protein occurs in the organism, and this produces the fever. Zinc especially causes precipitation in unusual dilution.

In some recent experiments (not yet published) carried on under the Sprague Memorial Institute, Chicago, we have been able, by using

Bertrand and Javillier's [22] calcium zincate method of isolating zinc, and Ganazzini's [23] basic urate of zinc test to verify its presence, to trace zinc, in the case of guinea pigs, which were exposed for as short a time as 40 minutes to the inhalation of brass fumes, through the lungs (6 hours afterwards), and liver and kidneys (24 hours afterwards).

It is very probable that the peculiar toxicity of zinc is due, as Armit has found in the case of nickel carbonyl, to its being introduced in a gaseous form, perhaps zinc carbonyl, and that the zinc is deposited as a slightly soluble compound in a very fine state of subdivision over the immense area of the respiratory surface.

SCOPE OF THE BRASS INDUSTRY.

In brief, this may be said to include all the nonferruginous metal trades, since the brass furnace is used for melting and alloying practically all metals except iron and steel. Zinc is an almost universal constituent, both because it is cheap and because of the physical properties it bestows upon the alloy.

England, Germany, and France are all great centers of brass manufacture. In America, according to the Bureau of Census [24] the products of the industry exceed $100,000,000 in annual valuation, of which over 50 per cent is controlled by Connecticut manufacturers, with a large part of the remainder in the States of New York, Pennsylvania, Illinois, and New Jersey.

The products of manufacture in this industry are exceedingly varied and important, such as trinkets and fixtures of all kinds, chandelier, bed, and soda-fountain parts, valves, couplings, nipples, white metal, German silver, gun metal, bell metal, type metal, aluminum and all its alloys, solders, babbitt, pewter, railway-car journals, and the like.

CHICAGO BRASS MANUFACTURING.

In the summer of 1910 there were 182 brass-manufacturing concerns inspected in Chicago.[1] Of these 89 were found to be engaged in the brass foundry or refining business, representing, in all, 2,212 employees within the foundries. These foundries were found to be located in all manner of places, from basements, midfloors, and top floors in great buildings, to specially built foundry buildings.

It was found that skilled labor was almost altogether employed in the small jobbing and specialty shops, whereas the large concerns, which were usually making standard-type products, had machine molds, and employed large numbers of unskilled foreigners. Women were found to be employed only in core work, usually in small rooms more or less ineffectively partitioned off in one corner of the foundry

room. Skilled laborers were found to be mostly Americans, Englishmen, Scandinavians, and Germans. The unskilled, who outnumbered the former by 10 to 1, were nearly all Poles or Bohemians. Twelve of the 89 firms employed union labor only. Most of the large concerns were strictly nonunion, whereas the balance may be said to have been "open shop." It was found that the nonunion concerns and many of the others were united together in an organization known as the Chicago Brass Manufacturers' Association, which maintained a central office, and had, as a principal duty, the employing and approving of workmen.

The question of ventilation in these 89 foundries was carefully investigated. It was found that 45 were so situated that surrounding buildings interfered with whatever natural ventilation they had. That in only 6 were the furnaces located in a separate room from molding and casting quarters. Only 12 firms had a separate core room, whereas over one-fourth of the total firms had not provided separate quarters for processes strictly ulterior to foundry work. Practically everywhere only natural ventilation by means of roof apertures, windows, and doors was depended upon to free the foundry quarters from the noxious vapors of molten brass. Only 9 had made any attempt at artificial ventilation, such as suction fans, blow fans, and so forth. Adequate ventilation, especially as regards any sort of inclement weather, was found to exist in only 22 places, and in none of these could it be considered better than fair.

Light was found to be good in 50, fair in 21, poor in 17, and artificial only in 1 foundry. Temperature was unduly hot in 25 foundries, whereas it was found that nearly one-half depended upon soft-coal stoves for general room temperature in the wintertime, and not a few upon open salamanders. In many places the general sanitary arrangements, such as facilities for washing, places for changing clothes, and toilet rooms, were either lacking or very inadequate and usually fully exposed to the foundry vapors and fumes.

In no foundry was room space found to be less than 500 cubic feet per person. It is quite evident, however, that foundries should not have their cubic air space measured on the same basis as that of a living room or even a workshop room. The height of roof or ceiling was noted in each foundry and showed that in 26 it was 12 feet or less. When such was the case, with the absence of overhead ventilators, the escape of brass fumes from furnaces and during pouring was greatly hampered. In only two places were special rooms provided as eating quarters, and it was found that the workmen almost invariably ate their lunches in the foundry room. In most places the first pouring had been completed just before the noon hour, hence the fumes and sublimation products were still in the atmosphere to a greater or lesser extent at that hour.

There was considerable complaint among many brass molders of the constant physical and mental strain required at the present day. It was claimed that a foreman or other expert would set a pace on a certain class of work for a few hours' or a day's time, after which the men were compelled to keep up to this record or be docked on the day's pay. The hours of work in practically all places were found to be from 7 a. m. to 5.30 p. m., with a half-hour lunch period.

The amount of exposure to brass fumes varied considerably in different foundries and, to some extent, with different classes of workmen. In places where pouring was done but twice daily, the exposure was minimal; but where it occurred from 4 to 6 times daily, each time requiring from 10 to 30 minutes to clear the atmosphere, and in several large establishments, where pouring was practically continuous all day, there was an almost constant exposure. In the latter places the workmen often sickened before the day was over and had to quit for the day. The winter season was bitterly complained of by many workmen because of the necessity of closing the means of natural ventilation to prevent chilling of the molds. As a rule the furnace men were the most exposed and the greatest sufferers.

In places where refining of old scrap metal was done, cases of chronic plumbism were occasionally encountered. Also it was found that in nearly all foundries from one-half to 7 per cent of lead was contained in the alloy. Phosphorus was found to be in almost universal use but in limited quantities, and no diseases directly traceable thereto were found. In type foundries and refineries there seemed a liability to antimony poisoning, but no cases were discovered.

Other deleterious influences to which brass founders were exposed were found to be carbon-monoxide gas from improperly ventilated furnaces and the nauseating odors of burnt oil from oil-blast furnaces. Occasionally, where supplementary processes were carried on in the foundry quarters, the atmosphere was found contaminated with metallic dusts from polishing and buffing, with mineral acid and alkali vapors from cleansing processes, and cyanide vapors from plating tanks.

Evidence of occupational disease was closely inquired into at all foundries, both from officials and workmen. There were a total of 114 officials consulted, representing 83 foundries. Of these officials, 31 admitted the presence of occupational diseases in their own plants, 26 others gave interesting statements concerning the same, 46 declared no knowledge of the same, and 11 refused any comment. Of 187 workmen, 146 reported that they were subject to brass chills.

The forms of sickness most commonly complained of were: Brass chills, 45 foundries; smoke inhalations, 26 foundries (especially fumes from oil-blast furnaces): other acute sicknesses, 4 foundries; other

chronic sicknesses, 20 foundries (respiratory, gastro-intestinal); temperature variations, 11 foundries; fatigue, 3 foundries.

Of the total of 2,212 men and women in brass foundries, it was found that 451 were engaged in processes which need not have exposed them to the foundry atmosphere. Of the remaining 1,761 actually engaged in brass-foundry work, age statistics were carefully compiled, with the following startling disclosures: 17 over 50 years of age, about 60 over 45 years of age, and about 180 over 40 years of age, leaving 1,500, or 85 per cent, under 40 years of age.

An investigation carried on into the zinc-smelting industry in the Illinois River Valley, where three concerns employed upward of 2,000 men, disclosed the presence of the following industrial diseases and complaints: 1. "Zinc chills," which, from descriptions by the workmen, were exactly analogous to the brass-foundry-man's ague. However, this complaint was found to be of rather infrequent occurrence, as the smelters were not as much exposed to the zinc smoke as brass molders. 2. Lead poisoning, which was of greater frequency than among brass molders because of the handling of crude ores. 3. Summer colics, which the workmen alleged to be due to the drinking of ice-cold water when overheated, but which may have been the expression of a seasonal form of lead colic. 4. Respiratory afflictions, due to breathing zinc fumes, which existed with great frequency and were known among the men as asthma. 5. Carbon monoxide poisoning among the gas-plant workers, as all of the concerns made their own gas, which was used for fuel in the smelters. 6. Industrial alcoholism, which I so name because the workmen consider alcoholic liquors antidotal to various forms of trade sickness.

LIMITATION AND PREVENTION OF OCCUPATIONAL BRASS POISONING.

The chief means of preventing brass-founder's ague lie in the prophylaxis. This consists in proper hygienic arrangements in foundries and smelters, regulation of the habits of workmen, and large roomy quarters. All furnaces and furnace areas should be provided with hoods and stacks to draw off escaping vapors. In addition, ceiling ventilators or skylights provided with artificial means, such as suction fans, or blower systems, to be used in inclement weather, should be provided in every furnace and foundry room. The furnace room should be separate from the balance of the foundry. In large foundries with good ventilation, whether natural or artificial, brass chills practically never occur. The prevention of metallic fumes seems impracticable, although they can be largely absorbed by adding silicates, fluorides, and borate to the slag (Sigel). Adequate light, wet cleansing, and frequent whitewashing should be resorted to. In

addition, proper precautions as to lead poisoning, in certain classes of work, as well as the prevention of the other unhygienic conditions mentioned, should be looked into.

Individual precautionary measures, such as sponges, respirators, etc., have a restricted value, but are generally little and reluctantly used. Sickly or anemic workmen, boys, and women, those with a tubercular tendency, and chronic alcoholics should not be employed in brass foundries. The workmen should not eat in foundry quarters, where the air is filled with sublimation products; they should be allowed time for washing up before eating and longer lunch periods. They should be given adequate washing facilities and be provided with shower baths and have suits, at least of outer garments, for use during work hours.

No specific treatment for brass chills has been discovered. The more careful and observing workmen use mild emetics, since they claim that the production of vomiting relieves the distressing symptoms at once, while a good purge seems as beneficial as anything. As before stated, most of them resort to alcohol, usually whisky, but there is absolutely no proof that it has any beneficial effects. Many workmen seem to derive some benefit from drinking hot milk, to which they often add pepper. Sigel suggests that the workmen use sodium bicarbonate to form insoluble zinc carbonate, but says that, inasmuch as most of the metal finds its portal of entry by way of the respiratory system, this can do but very little good.

The State of Illinois has recently provided two laws for the effective prevention of occupational diseases, including brass poisoning, the enforcement of which lies with the department of factory inspection. The first of these came into force January 1, 1910, and is entitled "An act to provide for the health, safety, and comfort of employees in factories, mercantile establishments, mills, and workshops in this State, and to provide for the enforcement thereof."

The second came immediately following the report of the commission on occupational diseases to his excellency Gov. Charles S. Deneen, and has been enforced since July 1, 1911. It is entitled "An act to promote the public health by protecting certain employees in this State from the dangers of occupational diseases, and providing for the enforcement thereof."

---

[1] Report of Commission on Occupational Diseases to His Excellency Gov. Charles S. Deneen, Illinois, Jan. 1, 1911. Copies obtainable from State factory inspector, Chicago.

[2] Lehmann, K. B., and Saito: Experimental Untersuchungen ueber die quantitative Absorption von Staub durch Tiere bei genau bekannten Staubgehalt der Luft, Arch. f. Hyg., 1912, LXXV, s. 134. Also Lehmann, Saito, and Gfroerer: Ueber die quantitative Absorption von Staub aus der Luft durch den Menchen,

ibid, s. 152. Also Murgia, E.: Ricerca sull 'assorbimento e sulla tossicita di alcuni minerali di zinco, La Clinica Moderna, 1906, Vol. XII, 316–319.

[3] Lehmann, K. B.: Giess- oder Zincfieber, Arch. f. Hygiene, 1910, Bd. LXXII, s. 358–381.

[4] Sigel, J.: Das Giessfieber und seine Bekämpfung mit besonderer Berücksichtigung der Verhältnisse in Würtemburg, Vrtjschr. f. gerichtl. Med., 1906, XXXII, s. 174.

[5] Weyl: Handbuch der Arbeiterkrankheiten, 1908, note, s. 114.

[6] Simon and Knyvett in Oliver's Dangerous Trades, 1902, p. 460.

[7] Weyl: Handbuch der Arbeiterkrankheiten, 1908.

[8] Hayhurst, E. R.: The Brass Moulder's Secret, The Survey, New York, 1911, Vol. XXVI, No. 26, pp. 879–882.

[9] Tatham, J., in Oliver's Dangerous Trades, 1902, p. 135.

[10] Thackrah: Essay on the Effects of Arts, Trades, and Professions on Health and Longevity, 1830.

[11] Blaudet: Annales d'hygiene et de med. leg., 1845, XXXIII, 462.

[12] Greenhow: Med. Chir. Transact., 1862, p. 180.

[13] Schnitzer: Preussiche Mediz. Zeitung, 1862, s. 198.

[14] Moyer and Lavin: Chronic Brass Poisoning—Brassworker's Ague, Medicine, Detroit, 1904, p. 335.

[15] Pietrowiecz, S. R.: A Case of Brass Molder's Ague, Jour. Amer. Med. Assn., 1904, XLIII, p. 465.

[16] Kober, Geo. M.: Industrial and Personal Hygiene, 1908, p. 49.

[17] Arnstein, A.: Beitrag zur Kenntnis des Giessfieber, Weiner, Arbeiten aus dem Gèbiete der sozialen Med., 1910, I. Folge, s. 49–59.

[18] Kisskalt, K.: Ueber das Giessfieber und verwandte gewerbliche Metalldampfinhalationkrankheiten. Zeitschr. f. Hyg. u. Infectionkrank., 1912, LXXI, s. 472.

[19] Von Jaksch: Vergiftungen, 1897, s. 184.

[20] Armit, H. W.: Toxicology of Nickel Carbonyl. Journal of Hygiene, 1911, Vol. VII, pp. 525–551, and Vol. VIII, pp. 565–600.

[21] Hansen, C. A.: Copper Poisoning, Metallurgical and Chemical Engineering, Vol. IX, No. 2, p. 67.

[22] Bertrand, G., and Javillier, M.: Sur une methode extrement sensible de precipitation du zinc, Bulletin de la Societe Chim. de Paris. 4a S. T. I. pag. 63, 1907. Annales de Chimie AN. Appl., T. II, pag. 179, 1907; and: Sur une methode pertant de doser de tres petites quantities du zinc, Compt. Rendu de l'Acad. des Scien., Paris, T. 145, 2 sem., pag. 924, 1907.

[23] Ganassini, D.: Ricerca qualitiva dello zinco e sua identificatione con una nuova reazione., 1909, Bollettino della Societa Medico-Chirurgica di Pavia, XXIII, 72–90.

[24] Bureau of Census, U. S. Dept. of Comm. and Labor, Special Reports, Manufactures, 1904, Part I, pp. cciv.

INDUSTRIAL MERCURIAL POISONING IN FELT-HAT MAKERS.

Frank E. Tylecote, M. D., D. P. H., M. R. C. P., honorary physician to the Salford Royal Hospital, Manchester, England; visiting physician to the South Manchester Union hospitals.

The association of chronic mercurial poisoning with the carroting process carried out by hatters' furriers has been long known, and as a result many methods of dressing the skins have been suggested as alternatives to the process of carroting, or brushing the fur with a

solution of the acid nitrate of mercury, but all the suggestions have so far proved useless in practice or have not had a fair trial, and carroting is still the favorite method of preparation.

It is not my intention, however, to deal here with mercurial poisoning, as it occurs in furriers, but as it is met with in felt-hat makers themselves, in whom, in this country, the existence of mercurial poisoning has been very little recognized, and is only scantily referred to in the literature. In America the work of Dr. Lloyd and in Austria that of Dr. Teleky has brought it into more prominence.

Some three years ago I saw a case which exhibited the symptoms of chronic mercurialism in a hat stover—that is, a man who looks after the hats when the hard-felt shapes are being treated at a temperature of 180° F in the stoving oven. On investigation I found that there were other such cases among the workmen in the same department, but that they were none of them recognized as suffering from mercurialism. On looking up the reports of the medical inspector of factories I found that all the cases notified in previous years in the hatting industry had occurred in furriers, and that no case appeared to have occurred in the felt-hat factories themselves, the furriers' processes being conducted in separate establishments, and the fur being always bought by the felt-hat manufacturer ready prepared.

In 1907, however, the attention of Dr. Legge had been called to the health of the felt-hat workers, and he had examined a series of them, finding definite evidence of mercurial poisoning in a slight degree in some of the men; but apparently none of the cases were bad enough to stop work and be notified, or if, as is more likely, disability did occur, then the correct diagnosis was not made, and the affections were put down as various obscure forms of nervous disease. This, at any rate, is the opinion, as expressed to me, of several medical men in practice in the hatting district. As a result of the investigations with which I followed up the above-mentioned first case—which was sent as one of spinal sclerosis—some 20 cases have been sent to me since, on the observation of which I offer some remarks below.

Some time later two of the workmen applied for compensation under the workmen's compensation act and lost their cases, owing to their not discharging the onus of proof that mercury was used in the course of their occupation, which the respondents refused to admit; in each of these cases, however, an ex gratia payment was made. Last year a third case was tried, and a full award was made after Prof. Walter M. Gardner of Bradford, copy of whose analyses I append by his kind permission, had proved the presence of mercury in the fur used, and I had proved the diagnosis.

THE PATH OF ENTRY AND THE RELATIVE RISKS OF THE DIFFERENT PROCESSES.

The fur blower inhales a considerable quantity of dust, carrying with it the more minute hairs and also particles of metallic mercury; as a result of this a bronchitis, which often becomes chronic, is set up by local irritation. In the cases where the mouth and gums of the blowers are healthy the lungs form the chief path of entry of the mercury to the system, and from the alveoli the absorption is probably easy, though the precise manner in which it occurs remains in doubt; the metallic globules are no doubt oxidized first, then dissolved, and absorption follows.

I wish to mention here that it is only among the blowers and finishers that I have seen any evidence of the undue prevalence of respiratory diseases. In the other departments I have made inquiry and can not satisfy myself that chest diseases are abnormally frequent; and in these latter I did not come across a single case of phthisis. I am quite willing to admit that the advanced cases of mercurial nervous degeneration—cases which have not been recognized as mercurial in the past—may develop phthisis in their last stages, just as any other cases of chronic nerve disease may, and commonly do, develop and die of an intercurrent chest disease; but I think the idea that these workers are especially prone to phthisis dates from the time when the term phthisis covered a much wider field of disease than it does now, and that there is not sufficient ground for the general statement.

In the case of the planker the moist atmosphere containing mercury is such that it can easily be taken in by the lungs, digestive tract, and skin. Once the gums have become unhealthy we have an ideal absorptive surface for the action of the mercurial vapor. From this time the development of the symptoms of mercurialism proceeds much more rapidly. The planker exhibits characteristic anæmia. The typical segs, callosities, and fissures on the planker's hands must not be looked upon as due to the mercury itself; the plankers' acid is responsible for what may be termed a trade dermatitis, and, as far as mercury is concerned, all that can be said is that any open sores or fissures provide especially easy paths for its absorption. The segs and callosities are the result of constant friction.

The readiness with which mercury is volatile at comparatively low temperatures, especially if in slightly acid solution, accounts for the fact that the planker, working at a moderate temperature, is as liable to poisoning as the stover or presser who is inhaling very hot vitiated air.

Most of the workers are quite careless about washing their hands after working and before eating, and very few clean their teeth.

Some chew tobacco while at work, and no doubt contaminate it with mercury from their hands, especially the planker, whose hand is constantly wet. Several of my cases were alcoholic subjects, and I formed the opinion that alcoholism renders them more liable to attack.

SYMPTOMS RELATING TO THE MOUTH AND THE ALIMENTARY CANAL.

In all cases of mercurial poisoning, whether acute or chronic, special attention has to be paid to the mouth, for it is here that some of the most distinctive and diagnostic signs are seen. To those accustomed to cases of chronic mercurialism, some of these signs are quite diagnostic, but others may entirely miss their significance. The profuse salivation met with in acute mercurialism is hardly ever seen, neither does ulcerative stomatitis occur, but slight increase of saliva is the rule. The tongue is large, flabby, silvery, or dove colored, with indented edges. The teeth are blackened, especially near the crowns, and the front teeth more markedly so than those further back. Caries is not often seen, and the process is rather one of erosion. The black eroded teeth are seen in their most typical form in the furriers, and next in the plankers, so that it is a reasonable assumption that the acid fumes play an important part in the causation of this condition. The teeth often show a considerable amount of tartar. Some degree of pyorrhœa alveolaris is common, and pus and blood may often be squeezed out of the sockets. The gums then become retracted, and soon the teeth become loose and may fall out. Legge has shown that they often fall in a definite order. The upper molars fall first. The mouth changes, as a whole, are more marked in inveterate smokers, and most of all in tobacco chewers. Vomiting was complained of in three cases; as a rule at night after work was over, but in two cases occasionally in the morning also. Diarrhea was not a usual symptom.

I have several times heard medical men say, "If he had worked in lead I should have said he had a blue line." This sentence explains fairly well the appearance of the gum margin, though the gum apart from the margin may be quite pale. There is not a blue line in the proper sense of the term, i. e., there is no line of granules, but there is often a cyanosed edge to the gum, which, at a casual glance, can be taken for a blue line. It is an almost uniform line, a purplish blue, not a "lead" blue. I should like to make a plea here for greater care in the diagnosing of a lead-blue line. It is far too lightly diagnosed. Any line, or even any blue line, is not a typical lead-blue line, any more than any spot is a typhoid spot, but to listen to evidence in the county court, on occasion, one feels that some, at any rate, give to it a much broader definition than others.

In some cases there was slight edema of the fauces and palate. The margin of the gum may be swollen.

The question of an odor must be mentioned; in acute mercurialism one has only to have smelt it once to be able to diagnose a case from it again at some distance. This is not so in chronic mercurialism, but I consider that there is a curious odor, definite, though not easy to describe, and not very pungent, but fairly lasting, so that it can be detected after the patient has left the room. Some would call it a metallic odor. It will be gathered, from what I have just said, that I regard this odor as a general one, emanating from the body as a whole, and not as a local odor coming from the mouth, as is the case in acute mercurialism. Some of the men complained of a bad taste in their mouths, but none of them described it as metallic. Anorexia was mentioned as a symptom by two.

One case was quite different from the rest. Here a blower of 25 years' service suddenly got an acute attack, which, from the after history, was apparently mercurialism; he had profuse salivation, diarrhea, and bloody stools; got better, went back to work, and, in a week, tremors began. Yet he had worked all those years with no signs at all. This is the only case I have seen starting more or less acutely, but most of my cases have worked for many years without the tremors—which in almost every case first caused them to seek advice—troubling them really seriously, and there is no doubt, as Dr. Legge has shown, that many of those who are doing their work to-day in the various processes of hat manufacture, are in fact suffering from chronic mercurialism to an extent which is, for the time being, at any rate, compatible with the due performance of their duties. If any further proof were needed of this statement, it is to be found in the fact that the average age of my cases, when they came under treatment, was 42.5 years.

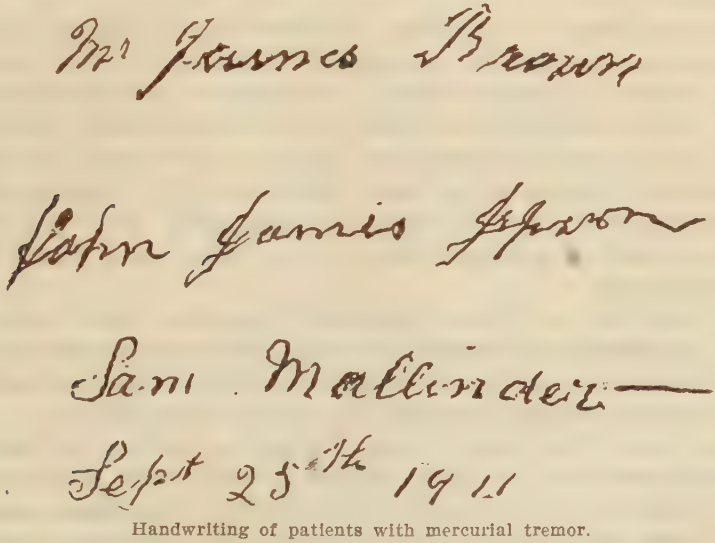
SYMPTOMS AFFECTING THE NERVOUS AND MUSCULAR SYSTEMS.

The symptom for which most sufferers first seek advice is the muscular tremor; this tremor is not so fine as some of the books on general medicine imply; it is rapid, and irregular in amplitude. It is usually increased on voluntary movement, it stops during sleep, and, when lying down, it is much less marked, and, in some cases, stops then also. Charcot did not believe in a mercurial tremor, but thought it to be a rare form of neurosis. Contact of the hands with the rapidly revolving cone may be a factor in its onset in some formers, but this will not account for the bulk of the cases, which occur in the workers in so many other departments.

The presence of this tremor, often called "hatters' shakes," should lead to a systematic examination of the nervous system, but this very rarely brings out any of the definite signs of organic nerve disease. The knee jerks are usually hyperactive, but ankle clonus and Babinski's sign are practically never seen.

The tremor is, as a rule, first noticed in the arms or hands; it may occur first on one side only, or be better marked, or coarser, on one side than on the other. In the cases in which the tremor rapidly becomes general, the speech is often affected. Occasionally, on asking the patient to close the eyes, a fine tremor of the eyelids can be noticed, and others, when asked to show their teeth—or, it may be, in the act of speaking—bring out in so doing a well-marked tremor of the lips and lower part of the face. The tongue may show it also. One man told me that his tremor was always worse when he was cold.

In many cases the tremor is well seen in a specimen of the writing of the patient, as in the appended reproduced autographs. In some of the quite severe cases, however, the writing showed no tremor. Often the tremor itself prevents the workman from doing his work



Handwriting of patients with mercurial tremor.

properly; in other cases it merely prevents him from performing the finer movements for himself, such as those involved in buttoning clothes and in lacing and unlacing boots.

Difficulty in locomotion may be complained of. One patient found great difficulty in getting up when he had once sat down in a chair, and vice versa, due to the stiffness of the muscles of the back, which rapidly subsided when he was taken away from work and put on treatment. Absolute rest in bed for a few weeks hastens recovery in these as in most of the cases.

Formerly some of the cases were diagnosed as disseminated sclerosis. On this issue it must be noted that nystagmus was only met with in one of my cases, while the alterations in the speech, which were sometimes of a stuttering or hesitating character, never assumed a staccato form. The mercurial tremor is finer than that of dissemi-

nated sclerosis, but coarser than that of exophthalmic goiter. It is, as I have said, increased on voluntary movement. In one case I found early optic atrophy. Two patients complained of dizziness.

There may be general muscular weakness. The grip is often weak, and the gait may be staggering.

The mental state may be altered; the patient may be in a very nervous state, which has been called—first, I believe, by Kussmaul—mercurial erythism, but I have often noted some loss of memory or slight mental dullness, and these especially in the alcoholic cases.

SYMPTOMS AFFECTING OTHER ORGANS.

Considerable loss of weight is not at all unusual, while many look pale, sallow, and even cachectic; general pains are frequently complained of.

I have no reason to think that the heart is appreciably directly affected by the mercury, and, as regards its effect on the blood vessels, and as a cause of granular kidney, I am sure that the effects can not in any way be compared in severity with those of lead. There is usually some degree of anemia, and complaints are frequently made of coldness of the hands and feet. Both Dr. G. E. Loveday and I have examined several blood films for granulation of the red cells, such as is seen in lead poisoning, but we have never found any granules present.

The lungs are, as I have mentioned, especially liable to attack among the blowers and finishers, but in the formers, plankers, pressers, and stovers, in whom most of my mercurial cases have occurred, I have seen no increased incidence of any pulmonary disease.

In two cases I have found traces of albumen in the urine, but one of these, at least, was a confirmed alcoholic. But though albumenuria has not been a symptom of especially noteworthy importance, scantiness of urine has occurred sufficiently often to be more than an accident. One patient, whose urine was perfectly normal, complained of it, and in those cases which I have admitted to my wards at the Salford Royal Hospital several of the charts have shown this very clearly; in most cases the diminution has persisted all the time the case was under observation.

Mercurial affections of the skin must be separated from those dermatoses met with in persons exposed to mercury, but in whom the skin lesions were certainly not caused by it. To this latter group belong the plankers' cracks, fissures, segs, and callosities, in the causation of all of which mercury takes no part, they being entirely due to the local irritation caused by the acid solution and by the manacles themselves. They have been well figured by Porter in his paper in the British Medical Journal of February 15, 1902.

Of the erythematous and papular eruptions which at times are met with in mercurialized subjects I have not seen any good examples in hatters. Twice I have seen localized scaly desquamation. The very gradual and long-continued absorption of the mercury apparently tells against the causation of skin lesions; they occur from time to time, however, in patients who are mercurialized medicinally.

In England we are not concerned with female labor in those hatting processes in which there is exposure to mercurial fumes, but in the countries where females are engaged in such processes, abortion is frequent in those so employed.

TREATMENT.

Treatment may be divided into prophylactic and symptomatic. As has been mentioned before, all workers in the same department are not equally liable to mercurial symptoms. Some have an idiosyncrasy which early shows itself. I have seen two cases in youths. Others are rendered especially liable by means of alcoholic habits, or by chewing tobacco, or by omitting to wash their hands before feeding, while the vast majority, in fact nearly all, never use a toothbrush and take no care whatever of their teeth. For these the remedy is plain. Pyorrhea must be treated on the usual lines, and many teeth may need removal. Antiseptic mouth washes may be needed, of which sodium phenate and those containing hydrogen peroxide are the best. As the lungs are equally important, or more so, than the gums, as a path of entry, one was not surprised, in one case where all the teeth had been removed and the gums had become quite sound again, to find the tremor and muscular weakness still developing.

For all the processes where fumes are given off and in which dust is thrown out, exhaust ventilation is the great desideratum, and this is now fairly well provided.

The plankers' kettles vary a great deal in the efficiency with which they remove the fumes of the boiling-acid solution. Those which have had continuing curtains of canvas affixed by the workmen to the metal hopper are far the least dangerous. These curtains should, in my opinion, be compulsory, though probably thin rubber would be a more satisfactory material than canvas. In the case of the longer metal hoppers, the continuing curtains are unnecessary, but these do not allow the rinsing to be frequently repeated, as do the short hoppers. It is curious that a simple remedy like the curtains should have been introduced by the men themselves, and while these are merely optional, it is only the most careful of the men who will take the trouble to put them on.

All cases coming under medical treatment should first of all have several weeks' rest in bed; this is good treatment for the anemia

and enables the general muscular weakness to be combated by properly regulated general massage, while the weight will be found to rise steadily.

The skin should be kept active by frequent warm baths, and a saline aperient mixture should be regularly given.

Medicinal treatment has in my hands been confined in most cases to the administration of potassium iodide in doses of from 5 to 10 grains three time a day, and I am satisfied that this, in combination with the general treatment outlined above, and the removal from the occupation, does much good. Sulphur, recommended by Arlidge, internally and in baths, I have not tried so far. I have used strychnine with good effect when there was general muscular weakness; it does nothing to increase the tremor. Gull recorded great improvement in the nervous symptoms as the result of electrical treatment.

If there has been one attack, it is advisable for the patient not to return to work in the same department, unless the attack has been a very mild one, one in the causation of which habits have been an important factor, and one which has proved capable of definite improvement.

In conclusion, I would like to especially urge the importance of hatters not returning to their work in a state of debility after an acute illness such as influenza or typhoid fever, as I am convinced from what I have seen, that in this state they are specially susceptible, and even if they have worked for years in mercurial fumes with apparent immunity, it is likely to fail them now.

My thanks are due to Dr. Graham Steell for permission to refer to some of the earlier cases which were in his wards at the Manchester Royal Infirmary, and to Dr. T. M. Legge, the chief medical inspector of factories, for many kindnesses.

Appendix.

SUMMARY OF ANALYSES OF MATERIALS USED IN HAT MAKING.

[By Prof. Walter M. Gardner, principal of the Technical College, Bradford.]

Sample of fur:	Percentage of Hg found.
No. 1	0.09
No. 2	.16
No. 3	.09
No. 4	.14
No. 5	.175
No. 6	.17
In a hat body	.138
In loose hair from planker's kettle	.082
In cloth from continuation curtain	.01
In planker's dilute acid	.001
In strong sulphuric acid used to make planker's acid	nil

The amount of mercury in the hats was thus roughly 1 part per 800, or 1 ounce mercury in 400 2-ounce hats. Arsenic was also detected in the acid.

BIBLIOGRAPHY.

Arlidge, J. T. Hygiene, diseases and mortality of occupation. London, Percival & Co., 1892. pp. 441, 442.

Charcot. Le mercredi médical, Paris, June 1892; and Journal des Connaissances Médicales, July 7, 1892.

Chief Inspector of Factories and Workshops. Annual reports of medical inspector.

Dargelos, M. J. A. Hygiene professionnelle des ouvriers chapeliers. Cong. Internat. d'Hyg. &c. Comp. Rend., 1889, par. 1890, pp. 770–782.

Deane & Squire. Annual Report of Chief Inspector of Factories, 1898, p. 167.

Dutil. Quoted in Practitioner, April, 1893, p. 295; also in Medical Record, New York, vol. ii, p. 483, 1892.

Freeman, J. Addison. Mercurial diseases among hatters. Trans. New Jersey State Medical Socy., 1860.

Gregoire. La main de l'ouvrier fouleur chapelier (illustrated). Annales d'Hygiène, 1898, xxxix, pp. 133–141.

Gull, Sir W. Guy's Hospl. Reports. New series, vol. viii, p. 136, 1853.

Jungfleisch. Sur les dangers du sécrétage des poils par le Mercure. Annales d'Hygiène, Dec., 1892, pp. 498–501.

Kussmaul, Adolf. Untersuchungen über den constitutionellen Mercurialismus, Würzburg, 1861.

Legge, T. M. A discussion on Diseases of Occupations, par. on Mercurialism. Brit. Medl. Journl., Aug. 17, 1901, p. 402.

Legge, T. M. Trans. 13th Internat. Cong. Hyg. & Dem. Brussels, 1903.

Lloyd, J. H. Twentieth Century Practice of Medicine. Article on Occupation Diseases, vol. iii, p. 350.

Lloyd, L. L., and Gardner, Wm. A case of mercurial poisoning and the estimation of mercury in textile materials. (The account of the analyses quoted.) Journal Society of Chemical Industry, Dec. 16, 1912. No. 23, vol. xxxi.

Marie, P. New Syd. Soc., vol. clii, p. 127, 1895 (with tracings of tremors).

Oliver, Sir Thomas. Dangerous Trades. London, John Murray, 1902. Article by T. M. Legge, pp. 434–446.

Pope, Walter. Phil. Trans., 1665, p. 21.

Porter, C. Remarks on felt-hat making; its processes and hygiene. (With illustrations of hands). Brith. Medl. Journl., Feb. 15, 1902; vol. i, 1902, pp. 377–381.

Reitz, J. Ueber die giftigen Hutmacherbeizen und deren nachtheiligen Einfluss auf die Gesundheit. Zeits. für die Staatsarzneikunde, 1829, p. 381.

Schaefer, H. Über Arbeitsparesen. Inaug. dissert., Berlin, 1890.

Schoulle, E. Des moyens propres à empêcher les accidents d'intoxication les ouvriers sécréteurs. Annales d'Hygiène, Sept., 1882.

Scott, A. L. Report Board of Health, Connect., 1887–88.

Taylor, J. G. Chronic mercurial poisoning, with special reference to the danger in Hatters' and Furriers' Manufactories (with tracings of tremors), Thesis for M. D. Cantab. Guy's Hospl. Repts., vol. lv, pp. 171–190.

Taylor, Alfred Swayne. Guy's Hospl. Repts., vol. x, 1864, pp. 173–187.

Tatham, J. Mortality of Occupations Report, supplement to 55th Annual Report of Registrar Genl., pt. ii, p. 51, 1897.

Teleky, Ludwig. Trans. Internat. Hatters' Cong., Vienna, Aug., 1909.

Teleky, Ludwig. Die gewerblicke Quecksilbergiftung. Berlin, A. Seydel, 1912.

Whitelegge, B. A. Circular to Hat Furriers. Annual Report of Chief Inspector, 1900.

Whitley, George. Sixth Report of Medical Officer to Privy Council, 1865, p. 361.

Williston, S. W. Tenth Report Board of Health, Connect., 1888–89.

DIE GEFAHREN IN DEM GEBRAUCHE DES QUECKSILBERS IN DER INDUSTRIE.

Dr. Karl Heucke, Königl. Gewerberat, Wesel, Rhein.

Quecksilber (Hydrargyrum, Argentum vivum, Mercurius) ist das einzige Metall, welches bei gewöhnlicher Temperatur flüssig ist, erst bei 40° C. wird es fest und kann dann gehämmert werden; es siedet bei 300° C., verdunstet aber schon bei gewöhnlicher Temperatur. Schon im Altertum war das Quecksilber bekannt, und Aristoteles, Theophrast und Plinius geben von Quecksilber Nachricht und als Gewinnungsstellen unter anderen Orten Armenien, Kapadocien, besonders aber Spanien an.

Heute sind uns als Gewinnungsorte besonders Almaden in Spanien, Californien, Böhmen und der Ural bekannt, in geringer Menge kommt das Quecksilber auch vielfach an andern Orten vor, z. B. Olpe in Westphalen, Idria im Kräin, in Kärnten im Steiermark.

Gediegen kommt es in kleinen Tröpfchen im älteren Gestein und im Diluvium vor, legiert auch als Gold- und Silberamalgam; am meisten verbreitet ist es als Zinnober (Schwefelquecksilber) HgS mit 86 Prozent Quecksilber.

Die Weltproduktion von Quecksilber gibt Fischer in seinem Handbuch der Technologie für 1898 auf 4,082 Tonnen an, darunter—

	Tonnen.
Vereinigte Staaten	1,076
Spanien	1,681
Oesterreich	500
Russland	633
Italien	192

Dagegen gibt Ost in seiner Chemischen Technologie für das Jahr 1900 die Weltproduktion nur auf 3,523 Tonnen an, davon erzeugt—

	Tonnen.
Vereinigte Staaten	967
Spanien	1,111
Oesterreich	550
Russland	340

Das Quecksilber und seine Salze werden viel in der Medicin verwandt; ich erinnere nur an den Gebrauch des Calomel als Abführmittel und an das Sublimat als Antiseptikum, sowie an die Anwendung gegen Parasiten und bei Hautkrankheiten, sowie bei Syphilis. Ebenso mannigfältig ist die Anwendung des Quecksilbers und seiner vielfachen Verwendungen in der Industrie. Das Quecksilber wird gebraucht bei der Fabrikation von Barometern und Thermometern, bei der Herstellung von Glühlampen zur Erzeugung eines Vakuums durch Quecksilberpumpen, beim Vergolden und Versilbern, in der Spiegelfabrikation, in den chemischen Fabriken bei der Herstellung

von pharmazeutischen Quecksilberpräparaten, bei der Herstellung von Munition (Knallquecksilber), in der Elektrolyse bei der Herstellung von Alkalilange, in Kürschnereien und bei der Herstellung von Hutstoff in Hasenhaarschneidereien.

Sowohl das metallische Quecksilber wirkt durch sein Verdampfung schon bei gewöhnlicher Temperatur, ebenso wie seine meisten Salze ausserordentlich schädlich auf den Organismus so dass alle Betriebe, in denen Quecksilber oder seine Verbindungen gebraucht werden, zu den gesundheitsschädlichsten zu zählen sind, und alle diejenigen, die mit Quecksilber in Berührung kommen, ja selbst diejenigen, die zu lange mit Quecksilber behandelt werden, der Gefahr einer Quecksilbervergiftung ausgesetzt sind.

Ueber die Wirkungen des Quecksilbers und als Zeichen von Quecksilbererkrankungen führt Villaret folgendes an:[1] Anschwellen des Zahnfleisches, welches leicht blutet, leicht geschwürig ist, starker Geruch aus dem Munde, Lockern und Ausfallen der Zähne, starker Speichelfluss. Dann tritt Gliederzittern auf. Die Arme des Kranken bewegen sich stossweise hin und her, besonders wenn der Kranke beobachtet wird oder bestimmte Bewegungen ausführen will; ist er sich selbst überlassen, so wird er ruhig. Auch der Kopf und die Zungenmuskeln können von diesen unwillkürlichen Bewegungen ergriffen werden. Schliesslich tritt die sogenannte Mercurialcachexie bei dem Kranken ein, sie werden blutarm, die Verdauung liegt darnieder, der Mund ist zahnlos, an den Alveolen entwickeln sich Eiterungen, die Muskulatur ist schwach und atrophiert in immer höherem Grade, wie auch das Unterhautfettgewebe schwindet, so dass der Kranke auf's äusserste abmagert.

Auch Schoull[2] schildert die Folgen des Quecksilbers auf den Organismus in seiner Arbeit "Des moyens propres à empêcher les accidents d'intoxication chez les ouvriers sécréteurs" in ähnlicher Weise und schreibt:

Outre les dermatoses, parfois rebelles, que produit le contact prolongé et répété de la solution de nitrate acide de mercure, dermatoses qui peuvent ouvrir une voie plus facile à l'absorption, outre la stomatile plus ou moins intense à laquelle les ouvriers sont exposés, on remarque assez souvent chez eux un tremblement pouvant acquérir une violence étonnante; des symptômes d'anémie, profonde parfois; des troubles digestifs de différente nature, offrant comme fait remarquable un dégoût pour les substances azotées, et, au contraire, une préférence marquée pour l'alimentation végétale, les substances épicées, acides, etc., choses que leur sont, dans ces circonstances spéciales, éminemment nuisibles; on recontre aussi quelquefois des troubles dans les fonctions génésiques; enfin le produit de la conception peut se ressentir de l'intoxication à laquelle est exposé l'ouvrier sécréteur.

Um diese eben geschilderten Wirkungen des Quecksilbers auf den menschlichen Organismus zu verhüten, sind in den einzelnen Industriezweigen folgende Schutzmassregeln zu treffen.

Bei der Anfertigung physikalischer Instrumente, wie Thermometer, Barometer, ist es nicht zu verhüten, dass Quecksilber auf den Fussboden fällt, welcher deshalb vollkommen dicht und glatt sein muss. Ein Hauptfordernis ist eine augiebige Lüftung und möglichst niedrige Temperatur, da, wie schon erwähnt, das Quecksilber selbst noch bei 0° Dämpfe entwickelt, und diese Verdampfung mit steigender Temperatur zunimmt, so ist eine kühle Temperatur erforderlich, um die Quecksilberdämpfe möglichst zu verhüten, ein Luftzug ist hierbei aber zu vermeiden, da dieser nur zu begünstigend auf die Verdampfung des Quecksilbers einwirkt.

Die Arbeiter müssen möglichst glatte Ueberkleider tragen, die nach Arbeitsschluss in der Fabrik verbleiben, desgleichen eine Kopfbekleidung, sie sind ferner zur peinlichsten Sauberkeit anzuhalten, müssen nicht nur vor dem Einnehmen der Mahlzeiten und vor dem Verlassen der Arbeitesstätte sich waschen, sondern auch jedesmal den Mund ausspülen. Das Essen und Trinken in den Arbeitsräumen selbst ist streng zu verbieten. Arbeiterinnen und jugendliche Arbeiter sind von der Arbeit auszuschliessen, und der Gesundheitszustand der erwachsenen Arbeiter ist ärtzlich zu überwachen.

Für die Waschungen möchte ich Akremninseife ganz besonders empfehlen,[3] dieselbe enthält Schwefelwasserstoff (H_2S) und führt somit das anhaftende Quecksilber sofort in unlössliches Schwefelquecksilber (HgS) über. Obschon mir nicht bekannt ist, ob für das HgS ebenso wie für das PbS (Schwefelblei) die völlige Ungiftigkeit für den menschlichen Organismus festgestellt ist, so möchte ich dies doch annehmen, da sich das HgS genau so wie PbS verhält; denn beide werden durch H_2S in unlössliche Verbindungen übergeführt und in der Natur ist die grosse Affinität des Schwefels zu den beiden Körpern dadurch gekennzeichnet, dass beide Metalle hauptsächlich an Schwefel gebunden als Bleiglanz (PbS) und als Schwefelquecksilber (HgS) bergmännisch gewonnen werden und dass in den Bergwerken selbst keine Vergiftungen vorkommen, erst sobald die Verhüttung anfängt, beginnen die Quecksilbervergiftungen.

Das soeben Gesagte gilt auch für die Herstellung von Glühlampen. Zum Evakuieren der Glühlampen werden Quecksilberluftpumpen verwandt, beispielsweise Sprengel-Pumpen, die nach dem Princip des Quecksilber-Barometers gebaut sind und in ziemlich komplicierter Weise ganz aus Glass hergestellt werden. Diese Pumpen sind sehr zerbrechlich und ist die Möglichkeit gegeben, dass beim Bruch einer Glasstelle sich der ganze Quecksilberinhalt nach aussen ergiesst und sich auf dem Fussboden des Arbeitsraumes ausbreitet und durch Verdunstung und Berührung mit den Händen Quecksilberkrankheiten herbeiführen kann.

Um diesen Gesundheitsschädigungen möglichst vorzubeugen hat das Köngl. Polizei-Präsidium in Berlin am 22. November 1888 eine Verordnung erlassen, die folgendes bestimmt:

1. Der Arbeitsraum (Pumpstation) ist so einzurichten, dass stets frische Luft zu- und schädliche Luft abgeführt wird.

2. Die Beschäftigung der Arbeiter ist so zu regeln, dass den Quecksilbervergiftungen rechtzeitig vorgebeugt wird.

3. Alle in der Pumpstation sich länger aufhaltenden Arbeiter und Beamten müssen mit einem von der Direktion zu liefernden, zu unterhaltenden und wöchentlich einmal durch Waschen zu reinigenden Anzuge aus leinenem Ueberrock und Mütze bekleidet sein.

4. Zur Einnahme der Mahlzeiten muss ein besonderes, mit der Pumpstation nicht in Verbindung stehendes Zimmer vorhanden sein. Vor dem Betreten desselben haben die Arbeiter den oben beschriebenen Anzug abzulegen, sich Gesicht und Hände zu waschen und den Mund mit einer Lösung chlorsaurem Kali auszuspülen.

5. Das Waschwasser, welches Schwefelleber (Kalium sulfuratum, Hepar sulfuris) in Lösung enthalten muss, und die Lösung von chlorsaurem Kali sind von der Fabrik zu liefern. Ebenso ist dafür zu sorgen, dass sich die Arbeiter wöchentlich dreimal unter warmer Douche abspülen und abwechselnd Wannenbäder nehmen.

6. Von Seiten der Fabrik ist ein Arzt anzunehmen, welcher die in der Pumpstation beschäftigten Arbeiter wöchentlich zu untersuchen und auf sofortige Entfernung derjenigen zu dringen hat, bei welchen sich die geringsten Anzeichen von Quecksilbervergiftung bemerkbar machen.

7. Die Beobachtungen des Arztes sind in ein Buch einzutragen welches den revidierenden Beamten auf Erfordern vorzulegen ist. Auch jetzt noch werden in sehr vielen Glühlampenfabriken, namentlich in solchen, die Metallfadenlampen herstellen, die Lampen ausschliesslich noch mit Quecksilberluftpumpen evakuiert, während andere Firmen sich vorzugsweise der Oelpumpen bedienen. Ganz ohne Quecksilberpumpen kann ein modernes Glühlampenwerk nicht wol auskommen, da gewisse Lampentypen sich auf anderen Pumpen nicht gut herstellen lassen.

Es ist indessen ausdrücklich hervorzuheben, dass in neueren Glühlampenfabriken nur noch rotierende Quecksilberpumpen im Gebrauch sind, die etwa nach Art der Gasuhren gebaut sind und in denen das Quecksilber in einem eisernen trommelartigen Gefäss vollkommen hermetisch eingeschlossen ist. Es ist bei diesen Pumpen jede Möglichkeit ausgeschlossen, dass sogar beim Eintreten von Defekten das Quecksilber heraustritt und hierdurch mit der äussern Luft in Berührung kommt. Diese rotierenden Quecksilberluftpumpen sind daher unbedingt als durchaus gesundheitsunschädlich zu bezeichnen.

Zu den gefährlichsten Arbeiten mit Quecksilber gehört die Quecksilberspiegel-Fabrikation. Zur Herstellung der Spiegel breitet man auf einer ebenen, glatten horizontal liegenden Marmorplatte eine Zinnfolie (Stanniol) aus, überstreicht zunächst die Folie mit Quecksilber und schüttet dann 2–3 mm Quecksilber darauf, legt hierauf die sorgfältig gereinigte und polierte Glasplatte, so dass der Rand stets in das Quecksilber eintaucht. Nun wird der Spiegel mit Gewichten beschwert und der Platte eine geringe Neigung gegeben, damit das überschüssige Quecksilber abfliessen kann. Nach einiger Zeit (24 Stunden) legt man den Spiegel mit der Amalgamseite nach oben und stellt ihn schräg (geneigt) auf, damit sich das überschüssige Quecksilber vollständig entfernen kann.

Um den Gefahren, die sich bei diesen Arbeiten ergeben, entgegenzutreten, hat der Herr Minister für Handel und Gewerbe am 18. Mai 1889 resp. am 22. August 1893 für Preussen nachfolgende Vorschriften erlassen, die auch für Bayern gleichlautend am 30. Juli 1889 folgten:

1. Die Herstellung von Quecksilberspiegeln darf nur in Räumen, welche zu ebener Erde gelegen sind und entsprechend kühl gehalten werden können, erfolgen. Die Fenster aller Räume, in welchen die Möglichkeit einer Entwicklung von Quecksilber-Dampf und Staub vorliegt (quecksilbergefährliche Räume) müssen nach Norden liegen.

2. In den Arbeitsräumen dürfen Quecksilbervorräte nicht gelagert werden. Die Aufbewahrung von Quecksilber hat in einem besonderen Raume, in verschliessbaren, gut verdichteten Behältern zu erfolgen.

3. In dem Belegraume darf nur das Belegen der Glastafeln, in dem Trockenraume dürfen nur solche Arbeiten, welche mit dem Trocknen der belegten Glastafeln verbunden sind, vorgenommen werden. Diese Räume dürfen mit Wohn-, Schlaf- und Haushaltungsräremen nicht in unmittelbarer Verbindung stehen. Die Türen, welche die Verbindungen derselben untereinander und mit anderen Arbeitsräumen herstellen, müssen guten Schluss haben, geschlossen gehalten werden und sind nur dann und so lange zu öffnen, als die Arbeit dies erforderlich macht. Der Aufenthalt nicht beschäftigter Personen, sowie der Aufenthalt der beschäftigten Personen vor und nach der Arbeit und während der Pausen in diesen Räumen ist nicht zu dulden.

Das Wischen (Putzen und Reinigen) der Glastafeln ist im Belegraume insoweit gestattet, als die letzte Fertigmachung der Gläser zum Belegen dies unabweislich erfordert.

4. Beim Anwärmen der Wischtücher ist die Verwendung von Kohlenöfen in allen Arbeitsräumen untersagt. In Belegraume und in anderen durch Quecksilberverwendung gefährlichen Räumen dürfen zum Anwärmen von Tüchern nur solche Wärmevorrichtungen (kleine Petroleumöfen) benutzt werden, bei welchen ein Austrahlen

von Wärme und eine Erhitzung benachbarter Luftschichten auf das geringste Maass beschränkt bleibt. Werden hierzu Petrolöfen verwendet, so dürfen die Verbrennungsgase nicht in den Arbeitsraum, sondern in einen Schlot entweichen. Die Erwärmung der Luft bei Kälte und ebenso die Abkühlung der Luft bei hoher Sonnenwärme ist für diese Räume noch durch Einführung angewärmter resp. abgekühlter Luft zu bewirken. Die Temperatur der eingeführten angewärmten Luft darf niemals 15° überschreiten. In Lagerräumen, Wischräumen und anderen die Gesundheit der Arbeiter nicht gefährdenden Räumen ist die Benutzung gewöhnlicher eiserner Oefen gestattet.

5. Soweit die Witterung und der Gang der Fabrikation es erlaubt, sind die Fenster der durch Quecksilberverwendung für die Gesundheit gefährlichen Räume vor und nach der Arbeit möglichst offen zu halten.

6. Die Grösse der Beleg- und Trockenräume ist so zu bemessen, dass pro Kopf der darin beschäftigten Personen in den ersteren ein Luftraum von mindestens 40 cbm., in den letzteren von mindestens 30 cbm. entfällt. Die Höhe der Räume muss mindestens 3.5 m. betragen. Durch eine nicht auf natürliche Temperatur-Differenzen beruhende, während der Arbeitszeit stets wirksame Ventilationsvorkehrung (Anwendung einer Lockfeuerung ausserhalb der Räume, eines Gas- Wasser- oder anderen Motors) ist dafür Sorge zu tragen, dass die Luft der Beleg- und Trockenräume bei geschlossenen Fenstern und Türen durch Zu- und Abführung von mindestens 60 cbm. Luft pro Kopf und Stunde während der Arbeitszeit fortlaufent erneuert wird. Die frische Luft ist in die oberen Luftschichten der betreffenden Räume einzuleiten. Die Absaugung der Luft ist so einzurichten, dass die unteren Luftschichten zuerst abgeführt werden. Zu- und Ableitung dürfen nicht an derselben Wand angebracht werden, sondern müssen sich möglichst gegenüber liegen und so eingerichtet sein, dass Zug vermieden bleibt. Der Arbeitgeber ist verpflichtet, diejenigen Kontrollapparate zu beschaffen, welche von dem zuständigen Aufsichtsbeamten als erforderlich bezeichnet werden, um festzustellen, ob die vorhandene Ventilationsanlage den gestellten Anforderungen entspricht.

7. Die Temperatur der Luft in den Beleg- und Trockenräumen ist möglichst gleichmässig zu halten. Erreicht an einem Tage die Temperatur der Luft in diesen Räumen die Höhe von 25° C. und darüber, so ist die Arbeit einzustellen und an diesem Tage nicht wieder aufzunehmen. In jedem Beleg- und Trockenraume ist ein Thermometer anzubringen, an welchem durch eine in die Augen fallende Marke die zulässige höchste Temperaturgrenze bezeichnet ist. Das

Thermometer ist in Kopfhöhe und nicht an der Umfassungswand oder in der Nähe einer Türe oder eines Fensters anzubringen.

8. Der Fussboden der Beleg- und Trockenräume muss aus glattem Asphaltbelag, ohne Fugen, Ritzen und Sprünge bestehen, mit leichter Neigung zu einer Sammelrinne für das auf den Boden gelangende Quecksilber und mit Sammelbecken.

9. Die Wände der Beleg- und Trockenräume sind, sofern sie aus Mauerwerk bestehen, glatt zu verputzen. Wände aus Holz müssen aus gehobelten, gut gefügten und verkitteten Brettern hergerichtet sein und an der Decke und am Boden dicht schliessen. Wände und Decken sind mit Oelfarbenanstrich zu versehen und allwöchentlich abzuwaschen.

10. Die Belegtische und Trockengestelle müssen so eingerichtet sein, dass das beim Anträuken der Zinnfolie, beim Uebergiessen derselben mit Quecksilber, beim Pressen der belegten Platten und beim Trocknen der Spiegel abfliessende Quecksilber möglichst schnell in die aufgestellten Auffangsbehälter gelangt. Nach Schluss der täglichen Arbeitszeit ist der Belegtisch sorgfältig von Quecksilber zu säubern. Die Auffangsbehälter sind so einzurichten, dass sie vollkommen verschlossen sind, bis auf eine enge, dem Einlass des Quecksilbers dienende Oeffnung. Die Anbringung von Filtriereinrichtungen ist nur in den Behältern selbst, nicht auf den Belegtischen gestattet.

Das Anreiben (Antränken) der Zinnfolie mit blossen Händen ist den Arbeitern zu untersagen.

11. In Belegräumen und in allen sonstigen Räumen, in welchen Quecksilber verwendet wird, ist die peinlichste Sauberkeit und Vorsicht zu beobachten. Jedes Verschütten und Verspritzen von Quecksilber ist möglichst zu vermeiden. Der Fussboden solcher Räume ist von Beginn der täglichen Arbeit und von Wiederbeginn der Arbeit nach voraufgegangener Pause reichlich mit Wasser zu besprengen und täglich nach Schluss der Arbeit nach reichlicher Besprengung mit Wasser auszukehren. Kehricht, sowie der Inhalt von Sammelbecken in Fussboden ist täglich aus den Arbeitsräumen zu entfernen und in verschlossenen Behältern aufzuheben. Mit dem Auskehren solcher Räume dürfen in der Regel nur Personen beauftragt werden, welche im übrigen bei der Arbeit mit Quecksilber nicht in Berührung kommen. Wo dieses ausnahmsweise nicht ausführbar sein sollte, ist dafür zu sorgen, dass die Arbeiter mit Auskehren häufig, mindestens wöchentlich, abwechseln.

12. Zur Reinigung von Quecksilberabfällen sind, soweit dieselbe in den Beleganstalten selbst und nicht in besonderen Läuterungsanstalten ausgeführt wird, gläserne Scheidetrichter zu verwenden. Die Reinigung quecksilberhaltiger Tücher, Lappen und Anreibeballen ist in gleicher Weise oder durch Auswaschen zu bewirken. Das

Ausklopfen solcher Tücher, Lappen und Anreibeballen ist untersagt, sofern es nicht auf mechanischem Wege in verschlossenen, gegen Staub vollkommen undurchlässigen Behältern ausgeführt wird; auch sind gebrauchte Tücher möglichst häufig durch neue zu ersetzen. Die vorstehend bezeichneten Reinigungsarbeiten dürfen nicht in den Arbeitsräumen vorgenommen werden. In dem Aufbewahrungsraum für Quecksilbervorräte sind sie gestattet.

13. Eine Beschäftigung in quecksilbergefährlichen Räumen darf nur solchen Personen gewährt werden, welche eine Bescheinigung eines approbierten Arztes beibringen, dass nach dem Ergebnis der körperlichen Untersuchung besondere Umstände, welche von der Beschäftigung in einer Spiegelbeleganstalt aussergewöhnliche Nachteile für ihre Gesundheit befürchten liessen, nicht vorliegen. Die Bescheinigungen sind zu sammeln, aufzubewahren und dem nach § 139 b der Gewerbeordnung zuständigen Aufsichtsbeamten auf Verlangen vorzulegen.

14. In Beleg- und Trockenräumen dürfen Arbeiter in den Monaten Oktober bis einschliesslich April nicht länger als 8 Stunden, in den Monaten Mai bis einschliesslich September nicht länger als 6 Stunden täglich beschäftigt werden. Nach Ablauf der Hälfte der täglichen Arbeitszeit in diesen Räumen ist eine mindestens zweistündige Pause zu gewähren. Eine anderweite Beschäftigung der Arbeiter seitens des Arbeitsgebers ausser der vorstehend bezeichneten Zeit ist nur dann zulässig, wenn sie nicht in den Räumen erfolgt, welche durch Quecksilberverwendung die Gesundheit der Arbeiter gefährden. Für Anlagen, in welchen Quecksilber-Erkrankungen der Arbeiter häufiger auftreten, kann auf Antrag des nach § 139 b der Gewerbeordnung zuständigen Aufsichtsbeamten die Maximalarbeitszeit von 8 resp. 6 Stunden täglich für die Arbeiter in Beleg- und Trockenräumen verkürzt werden.

15. Der Arbeitgeber hat die Ueberwachung des Gesundheitszustandes der von ihm in gesundheitsgefährlichen Räumen beschäftigten Arbeiter einem dem Aufsichtsbeamten (§139 b der Gewerbeordnung) namhaft zu machenden approbierten Arzte zu übertragen, welcher in zwei Wochen mindestens einmal eine Untersuchung der Arbeiter vorzunehmen und den Arbeitgeber von jedem Falle einer ermittelten Quecksilber-Erkrankung in Kenntnis zu setzen hat. Der Arbeitgeber darf Arbeiter, bei welchen eine Quecksilber-Erkrankung ermittelt ist, zu Beschäftigungen bei welchen sie mit Quecksilber in Berührung kommen, bis zur völligen Genesung nicht zulassen.

16. Der Arbeitgeber ist verpflichtet, ein Krankenbuch zu führen oder, unter seiner Verantwortung für die Vollständigkeit und Richtigkeit der Einträge durch den mit der Ueberwachung des Gesundheitszustandes der in gesundheitsgefährlichen Räumen beschäftigten

Arbeiter beauftragen Arzt oder durch einen Betriebsbeamten führen zu lassen. Das Krankenbuch muss enthalten:

1. Den Namen dessen, welcher das Buch führt.
2. Den Namen des mit der Ueberwachung des Gesundheitszustandes der Arbeiter beauftragten Arztes.
3. Die Namen der erkrankten Arbeiter.
4. Die Art der Erkrankung und die vorhergegangene Beschäftigung.
5. Den Tag der Erkrankung.
6. Den Tag der Genesung, oder wenn der Erkrankte nicht wieder in die Arbeit getreten ist, den Tag der Entlassung.

Das Krankenbuch ist dem Aufsichtsbeamten, sowie dem zuständigen Midizinalbeamten auf Verlangen vorzulegen.

17. Der Arbeitgeber hat alle in den durch Quecksilberverwendung gefährlichen Räumen beschäftigten Arbeiten mit vollständigen, möglichst anschliessenden Arbeitsanzuge aus glattem, dichten Stoff ohne Falten und Taschen, mit einer Mütze und mit anliegendem Schuhwerk versehen. Jedem Arbeiter ist eine besondere, für ihn passende Arbeitskleidung zu überweisen. Der Arbeitgeber hat dafür Sorge zu tragen, dass die Arbeitskleider stets nur von denjenigen Arbeitern benutzt werden, welchen sie zugewiesen sind, und dass dieselben nach wöchentlichem Gebrauche stets gereinigt und während der Zeit, wo sie sich nicht im Gebrauche befinden, an dem für sie zu bestimmenden Platze aufbewahrt werden.

18. Ausserhalb der gesundheitsgefährlichen Räume, doch in der Nähe derselben, ist für die in denselben beschäftigten Arbeitern ein nach Geschlechtern getrennter Wasch- und Ankleideraum und getrennt davon, sofern die Arbeiter nicht ausserhalb der Anglage speisen, ein Speiseraum einzurichten. Beide Räume müssen sauber gehalten und während der kalten Jahreszeit geheizt werden. In dem Wasch- und Ankleideraum müssen Gefässe zum Zwecke des Mundausspülens, die etwa ärztlicherseits für erforderlich gehaltenen besonderen Mundspülwässer, Seife und Handtücher, sowie Einrichtungen zur Verwahrung derjenigen gewöhnlichen Kleidungsstücke, welche vor Beginn der Arbeit abgelegt werden, in ausreichender Menge vorhanden sind.

In dem Speiseraume oder an einer anderen geeigneten Stelle müssen sich Vorrichtungen zum Anwärmen der Speisen befinden. Der Arbeitgeber hat den in gesundheitsgefährlichen Räumen beschäftigten Arbeitern Gelegenheit zu gewähren, wenigstens einmal wöchentlich ein warmes oder kaltes Bad (je nach dem Wunsche des Arbeiters oder nach ärztlicher Anordnung) zu nehmen.

19. Der Arbeitgeber hat Vorschriften zu erlassen, welche eine Anweisung hinsichtlich des Gebrauchs der im 17 bezeichneten Bekleidungsgegenstände und hinsichtlich der Vorsichtsmassregeln beim Arbeiten mit Quecksilber für die in gesundheitsgefährlichen

Räumen beschäftigten Personen, namentlich aber folgende Bestimmungen enthalten muss:

(1) Die Arbeiter dürfen Branntwein, Bier und andere geistige Getränke nicht mit in die Anlage bringen.

(2) Die Arbeiter dürfen Nahrungs- und Genussmittel nicht in die Arbeitsräume mitnehmen, dieselben vielmehr nur im Speiseraume aufbewahren. Das Rauchen und Schnupfen im Arbeitsraume ist zu verbieten. Das Einnehmen der Mahlzeiten ist den Arbeitern, sofern es nicht ausserhalb der Anlage stattfindet, nur im Speiseraume gestattet.

(3) Die Arbeiter haben die Arbeitskleider in denjenigen Arbeitsräumen und bei denjenigen Arbeiten, für welche es von dem Betriebsunternehmer vorgeschrieben ist, zu benutzen.

(4) Die Arbeiter dürfen erst dann den Speiseraum betreten, Mahlzeiten einnehmen oder die Fabrik verlassen, wenn sie zuvor die Arbeitskleider abgelegt haben, die Haare vom Staube gereinigt, Hände und Gesicht sorgfältig gewaschen, die Nase gereinigt und den Mund ausgespült haben. Das tragen langer Bärte ist untersagt. Ausserdem ist in den zu erlassenden Vorschriften vorzusehen, dass die Arbeiter im Falle der Zuwiderhandlung gegen die im Abs. 1 bezeichneten Vorschriften vor Ablauf der vertragsmässigen Zeit und ohne Aufkündigung entlassen werden könne.

Werden in einem Betriebe in der Regel 20 Arbeiter beschäftigt, so sind die in diesem Paragraphen bezeichneten Vorschriften in die nach § 134[a] der Gewerbeordnung zu erlassende Arbeitsordnung aufzunehmen.

20. In jedem durch Quecksilberverwendung die Gesundheit der Arbeiter gefährdenden Arbeitsraume, sowie in dem Ankleide- und Speiseraume muss eine Abschrift oder ein Abdruck der § 1–19 dieser Vorschriften und der gemäss § 19 vom Arbeitsgeber erlassenen Vorschriften an einer in die Augen fallenden Stelle aushängen. Der Betriebsunternehmer ist für die Handhabung der in § 19, Abs. 1, bezeichneten Vorschriften verantwortlich und verpflichtet, Arbeiter, welche denselben wiederholt zuwiderhandeln, aus der Arbeit zu entlassen.

21. Neue Anlagen, in welchen Quecksilberspiegel belegt werden sollen, dürfen erst in Betrieb gesetzt werden, nachdem ihre Einrichtung dem zuständigen Aufsichtsbeamten (§ 139[b] der Gewerbeordnung) angezeigt ist. Der letztere hat nach Empfang dieser Anzeige schleunigst durch persönliche Revision festzustellen, ob die Einrichtung der Anlage der erlassenen Vorschriften entspricht.

22. Im Falle der Zuwiderhandlung gegen die § 1–21 dieser Vorschriften kann die Polizeibehörde die Einstellung des Betriebes bis zur Herstellung des vorschriftsmässigen Zustandes anordnen.

Dass so strenge Vorschriften nicht ohne Einfluss auf die Quecksilberspiegelindustrie bleiben würden, war vorauszusehen, und tatsäch-

lich werden heute fast nur noch ausschliesslich Silberspiegel hergestellt. Es ist dies allerdings nicht allein auf die erlassenen Vorschriften zurückzuführen, sondern zum grössten Teil auch auf den geringen Silberpreis. In Fürth demjenigen Orte, in welchem eine ausgedehnte Quecksilberindustrie betrieben wurde, sind heute nur noch 2 kleine Fabriken in Betrieb, die Quecksilberspiegel herstellen, und zwar für das Ausland.

Für die Herstellung chemischer Präparate aus Quecksilber findet das oben bereits hinsichtlich der physikalischen Instrumente Gesagte sinngemässe Anwendung, und sind ausserdem Räume, wo das Entweichen gesundheitsschädlicher Gase, Dämpfe oder staubförmiger Körper nicht hinreichend verhindert werden kann, so wie Arbeitsräume mit hoher Temperatur mit einem wirksamen Ventilator zu versehen. Ferner ist bei allen chemischen Prozessen, bei denen giftige Gase oder Dämpfe auftreten, Vorsorge zu treffen, dass dieselben in ungefährlicher Weise abgeführt werden können. Mit einigen Worten möchte ich hier noch besonders des Knallquecksilbers (Knallsaures Quecksilber $C_2HgN_2Q_2$) Erwähnung tun. Das knallsaure Quecksilber entsteht durch Erwärmung eines Gemenges von Alkohol, Salpetersäure und salpetersaurem Quecksilberoxyd, es kristallisiert in seideglänzenden weissen Nadeln; beim Erhitzen, sowie durch Stoss und Schlag, auch durch conc. Schwefelsäure, explodiert es äusserst heftig. Man benutzt es hauptsächlich zum Füllen von Zündhütchen, die Anwendung als Schluss- oder Sprengmaterial ist wegen der gefährlichen Handhabung und wegen der enormen zerstörenden Wirkung nicht möglich. Die Rohrwände der Feuerwaffen würden zersprengt werden und nur in kleinsten Ladungen bei Zimmerpistolen und Flobertbüchsen ist die Anwendung möglich. Bei der Fabrikation überwiegt neben der Quecksilbergefahr und anderen möglichen Vergiftungen die Explosionsgefahr und ist hierauf ganz besonders Rücksicht zu nehmen. Die Berufsgenossenschaft der chemischen Industrie hat daher in weitgehenster weise Vorschriften[4] für solche Analgen erlassen, die sämmtlich hier anzuführen zu weit führen würde. Die Vorschriften erstrecken sich auf Umzäunung und Warnungsschilder, Schutzwälle, Schutz mauern, Schutz durch Anpflanzungen, Blitzschutz, Beleuchtung und Heizung der Räume, zulässige Zündsatzmengen, Aufbewahrung und Verarbeitung und Trocknen des Knallquecksilbers, Beseitigung der Abwässer, Vernichtung der Zündsatzabfälle, Vernichtung der Filtertücher, Vernichtung der Ausschuss-Sprengkapseln und Ausschuss-Zündhütchen, Beseitigung des Zündstaubes und Verpackung der fertigen Zündhütchen, Verbot geistiger Getränke, Kleiderwechsel und Verhalten bei Gewitter.

Zum Schluss komme ich zu der Hutstofffabrikation. Für die Hutstofffabrikation werden die Felle der wilden und zahmen Kaninchen und die der Hasen verwandt. Das Fell des zahmen Kaninchen ist meist weniger wert als das der wilden; das beste Material

sind Hasenhaare. Die Felle werden im Grossen (en gros) bezogen und kommen zunächst in die Fellzubereitung. Hier werden dieselben der Länge nach (Bauchseite und Rückenseite) aufgeschnitten, die Ohren werden abgeschnitten, sowie Fett und Schmutzflecke entfernt. Die Felle werden dann geglättet, blütige, verklebte Stellen werden mit einem "Ritzer" gelöst. Dann müssen die Nuthen oder Spitzen entfernt werden, es sind dies die langen Haare. Bei den Hasen sind die Spitzen oben dick und unten dünn und müssen mit der Scheere abgeschnitten werden, geschieht aber auch mit Maschinen; bei den Kaninchen ist die Spitze von oben bis unten dick und muss für feinere Sorten mit der Hand herausgerissen werden. Die so vorbereiteten Felle kommen nun in die Beize oder Sekretage. Diese besteht darin, dass die Felle auf der Haarseite mit einer Lösung von Quecksilbernitrat eingerieben werden. Man unterscheidet "gelb" und "weiss" gebeizte Haare. Die gelbe Beize enthält mehr Salpetersäure und weniger Quecksilber, die weisse Beize umgekehrt weniger Salpetersäure und mehr Quecksilber. Die gelbe Beize wird rasch im Ofen getrocknet, die weisse Beize muss langsam trocknen. Nachdem die Felle mit der Beize eingerieben sind, werden dieselben, wie schon aus dem soeben Gesagten hervorgeht, im Ofen getrocknet. Die getrockneten, gebeizten Felle kommen nun auf Bürstenmaschinen, um die Haare zu lockern und alle Unreinigkeiten zu entfernen. Sodann werden die Felle geschoren, was meist mit Maschinen geschieht. Das Haar, welches ganz in der Form und Gestalt des Felles die Maschiene verlässt, wird auf einer Metallplatte aufgefangen und je nach den verschiedenen Körperstellen (Rücken, Seiten, Bauch) sortiert.

Es bleibt sodann noch die Arbeit des "Blasens" übrig. Beim Blasen werden die Haare verschiedener Güte und Farbe in bestimmten Verhältnissen mit einander gemischt und kommen in die Blasmaschiene. Das Haar ist nun für den Hutfabrikanten vollkommen gebrauchsfertig.

Namentlich die Verwendung der giftigen Beize aus Salpetersäure und Quecksilber und die mit Haar- und Schmutzteilen erfüllte Luft in den Arbeitsräumen sind für die Gesundheit der Arbeiter gefährlich; auch ist in allen Arbeitsräumen in der Luft Quecksilber enthalten. Für die Arbeiter und Arbeitsräume finden die für andere Anlagen, in denen Quecksilber verarbeitet wird, bereits angeführten Vorschriften entsprechende sinngemässe Anwendung. Ferner müssen die Arbeiter bei der Beizarbeit über das Handgelenk reichende Gummihandschuhe tragen.

Die Kammern für das Trocknen der Felle müssen so eingerichtet sein, dass die Trockenkammern nicht zum Zwecke des Einhängens der Felle und des Wegnehmens betreten werden müssen. Anlagen, in denen die Trockenkammern mit offenen Koakskörben geheizt wer-

den und zum Ein- und Ausgehen der Arbeiter forwährend offenstehen, so dass nicht nur Quecksilberdämpfe sondern auch Kohlenoxydgase den Arbeitern schädlich werden, sind zu verbieten. Zumal hiervon nicht nur die Arbeiter betroffen werden, die in den Trockenkammern zu tun haben, sondern sämmtliche Arbeiter der benachbarten Räume.

In Deutschland werden die Felle meist ausserhalb der Trockenkammern auf fahrbare eiserne Gestelle gehangen, und die Gestelle sammt den daran hängenden Fellen in die Trockenkammern gefahren, welche mit Dampf geheizt werden. Die Oeffnungen in den Trockenkammern für das Ein- und Ausfahren der Gestelle sind luftdicht abzuschliessen.

Zum Schluss möchte ich noch darauf hinweisen, was Eulenburg in seinem Handbuche der Gewerbehygiene bezüglich der Wirkung des Quecksilbers sagt: "Ganz besonders aber ist noch der nachteilige Einfluss für schwangere Frauen hervorzuheben; alle Erfahrungen stimmen darin überein, dass sie leicht abortieren und tote Kinder gebären."

Ich möchte daher vorschlagen für alle Anlagen, in denen Quecksilber oder quecksilberhaltige Stoffe benutzt und verarbeitet werden, die Beschäftigung verheirateter Frauen zu verbieten; denn es darf wohl angenommen werden, dass eine Mutter, die fortwährend der Einwirkung des Quecksilbers ausgesetzt ist, keine gesunden Kinder bekommen kann. Ebenso wichtig wäre es, das Verarbeiten von gebeizten Fellen, gebeizten Abfällen, Schwänzen und Lunten in der Hausindustrie gänzlich zu verbieten.

---

[1] Albrecht, Handbuch der Gewerbehygiene, 1896, S. 116.

[2] Annales d'ygiène publique, 3e série, v. 8 (1882), p. 262.

[3] Akremninseife hergestellt in der chemischen Fabrik des Dr. C. Zerbe. Allein-Vertrieb durch Petri & Stark in Offenbach a. M.

[4] Die Unfallverhütungsvorschiften der Berufsgenossenschaften der chemischen Industrie. C. Heymann. Berlin, 1912.

L'HYDRARGYRISME DANS LES COUPERIES DE POILS.

Dr. D. J. Glibert, Inspecteur Général du Travail à Bruxelles.

En Belgique, l'étamage des glaces a totalement disparu; à tel point qu'il y est devenu à peu près impossible, même à titre exceptionnel, de faire étamer le plus petit miroir: l'outillage nécessaire et la main d'œuvre compétente font défaut. La dorure au feu est en voie de régression accentuée et la fabrication des lampes électriques à incandescence, au moyen des pompes à vide au mercure, est, dans le royaume, d'une importance secondaire.

Ajoutons que dans les fabriques belges d'explosifs, les ouvriers exposés à l'influence du mercure sont en petit nombre.

D'autre part le sol belge ne contient pas de mines de mercure. Tout l'intérêt de l'intoxication hydrargyrique professionnelle se concentre donc, pour nous, à peu près exclusivement sur l'industrie de la fabrication des matières premières pour chapelleries.

Cette dernière industrie est très développée dans certaines provinces belges et elle y présente des caractères particuliers qu'il n'est point inutile de signaler. C'est donc à ce qui le concerne que nous bornerons la présente étude.

Comme on le sait, les opérations qui ont pour but de fournir à la chapellerie les poils de feutrage dont elle a besoin consistent (1) à fendre, à nettoyer les peaux de lapins et de lièvres (les termes techniques qui désignent ces opérations préliminaires sont: nettoyage, fendage, dégalage, carreletage) ; (2) à arracher (éjarrage) ou à couper (ébarbage) le poil dur impropre au feutrage; (3) à enduire d'une solution de nitrate acide de mercure les peaux en poils ainsi préparées (secrétage) et à les soumettre à l'action de la chaleur dans des fours spéciaux (étuves à secrétage) ; (4) à brosser les peaux à leur sortie des étuves (brossage) et à les livrer à l'action des machines à couper (coupage). Cette action a pour résultat de séparer les poils des tissus sous-jacents, lesquels se trouvent eux-mêmes divisés en fines lanières (vermicelle) que l'on utilise pour la fabrication de la colle de peau.

Contrairement à ce qui se passe dans beaucoup d'usines du continent, les couperies de poils en Belgique comportent presque toutes des ateliers de " soufflage " de poils. Cette dernière opération a pour effet de mélanger intimement les poils coupés; elle constitue la première phase du travail de chapellerie.

Comme on le voit par cet exposé sommaire, les opérations présentent un caractère différentiel très net au point de vue de la morbidité professionnelle: avant le secrétage pas d'intoxication â craindre; après le secrétage ou au cours de celui-ci, danger permanent mais variable en imminence. Les opérations qui précèdent le secrétage sont souvent effectuées à la main dans des manufactures totalement dépourvues de force motrice ou même au domicile de l'ouvrier. Les opérations de secrétage et celles qui le suivent sont toujours effectuées dans des usines, sauf un cas exceptionnel important et qu'il convient de signaler: le coupage à domicile des " chiquettes " secrétées au mercure.

Cette expression technique " chiquettes " demande un mot d'explication. Parmi les déchets de la préparation des peaux en vue du secrétage on rencontre certaines parties: bouts des pattes, queues, etc., qui sont encore garnies de poils utilisables à la condition de subir certaines manipulations spéciales. Ces déchets sont les " chi-

quettes;" les poils en sont coupés à la main, soit à l'état naturel (veule), soit après immersion dans l'acide nitrique et séchage (secret sans mercure), soit enfin après immersion dans la solution d'azotate de mercure et étuvage ultérieurs (chiquettes secrétées au mercure).

Le visiteur qui pénètre pour la première fois dans un atelier d'éjarrage ou d'ébarbage à la main ne peut se défendre d'une impression pénible. A priori, tout ce qu'il voit, tout ce qu'il éprouve, le pousse à considérer ces ateliers comme insalubres au suprême degré: une odeur peu prononcée mais désagréable vient à sa rencontre dès le seuil; le plus souvent les détails du fond de l'atelier s'estompent d'un brouillard opaque formé d'une infinité de filaments pileux en suspension dans l'atmosphère; les objeta les plus proches, de même que les ouvriers d'ailleurs, sont recouverts d'un épais duvet gris sale qui contribue à donner à l'ensemble un aspect des plus malpropres.

Dans ces conditions il n'est point étonnant que ces ateliers aient, pendant longtemps, été considérés comme particulièrement meurtriers et comme des foyers de pneumoconiose et de tuberculose professionnelle. J'avoue avoir moi-même partagé cette erreur lorsqu'il y a environ 20 ans je commençat l'étude approfondie de l'hygiène des couperies de poils.

Bientôt cependant l'examen détaillé des faits me réserva des surprises, et devant l'inutilité de mes investigations premières j'obtins du Ministre du Travail l'autorisation de faire procéder à une enquête médicale portant sur l'ensemble des travailleurs employés dans ces ateliers.

Cette enquête, conduite avec une scrupuleuse impartialité par des médecins fonctionnaires de l'Etat, lesquels ont, une à une, interrogé et examiné les personnes séjournant dans les ateliers, a démontré le peu de nocuité de ce genre de travail. On en trouvera d'ailleurs la preuve dans les chiffres du tableau qui eccompagne la présente étude, et qui donne quelques-uns des résultats généraux de nos recherches.

En fait, à part certaines lésions irritatives des fosses nasales (plus rarement du pharynx), certaines conjonctivites assez bénignes et parfois certaines otites externes, on ne trouve aucune maladie professionnelle grave qui puisse reconnaître pour cause l'inhalation des poussières dans les ateliers d'éjarrage. A notre avis, cette bénignité relative d'une atmosphère exceptionnellement chargée de poussières et de filaments provient de la nature de ceux-ci qui, longs, flexibles et facilement adhérents, s'arrêtent dans les premières voies et ne parviennent pas à franchir l'isthme du gosier.

En résumé nous pouvons formuler comme suit notre opinion sur les ateliers d'éjarrage et d'ébarbage à la main non spécialement ventilés: ateliers très malpropres, exposant aux lésions irritatives

des muqueuses les plus accessibles et des téguments externes, dépourvus de causes exceptionnelles d'insalubrité.

Au surplus l'éjarrage et l'ébarbage à la main sont très fréquemment remplacés par l'éjarrage et l'ébarbage à la machine. Ces dernières sont toujours munies d'un système de ventilation localisée et, dans ces conditions, les ateliers où elles fonctionnent convenablement peuvent être considérés comme des locaux de travail très acceptables.

L'enquête médicale dont nous venons de parler ne s'est point bornée à l'examen des ouvriers employés aux opérations qui " précèdent " le secrétage; tout naturellement elle s'est étendue aux opérations qui accompagnent celuici ou qui le suivent. Voici le relevé général des investigations:

	Nombre de sujets examinés.	État de santé.					
		Bon.	Pour cent.	Médiocre.	Pour cent.	Mauvais.	Pour cent.
Personnel employé aux opérations qui précèdent le secrétage:							
Hommes	705	648	91.91	55	7.80	2	0.28
Femmes	931	784	84.21	146	15.68	1	.11
Personnel employé au secrétage:							
Hommes	88	56	63.64	28	31.82	4	4.54
Personnel employé aux employés aux opérations qui suivent le secrétage:							
Hommes	44	34	77.27	10	22.72	.....	.....
Femmes	435	300	68.96	126	28.96	9	2.06

Il est facile de constater à la lecture du relevé qui précède, combien est précaire l'état de santé de tout le personnel qui est employé aux opérations qui accompagnent ou suivent le secrétage. Cette dernière opération surtout apparaît comme tout spécialement insalubre. Toutefois, il convient de se souvenir que son personnel se recrute dans la partie la plus malheureuse de la population ouvrière et que, bien souvent, la misère intervient comme facteur très important dans la genèse des troubles morbides qui atteignent cette classe de travailleurs.

Quoiqu'il en soit, l'influence du mercure est absolument indéniable et, dans certains cas, elle détermine des troubles pathologiques des plus graves.

On sait que le diagnostic de l'hydrargyrisme professionnel repose essentiellement sur les constatations de symptômes morbides que l'on peut diviser en deux groupes: ceux qui atteignent le tube digestif, ceux qui frappent le système nerveux.

Tube digestif.—N'insistons pas sur les signes vagues et imprécis, tels que l'anorexie, les digestions difficiles, les vomissements, la diarrhée. La stomatite hydrargyrique professionnelle se caractérise par une tuméfaction et un état fongueux des gencives, un liséré lie de vin ou rouge sale et, bien souvent, des ulcérations assez discrètes.

Contrairement à ce qui se passe dans l'hydrargyrisme thérapeutique, la salivation est plutôt rare; à la longue cette gingivite provoque la chute des dents.

Il est important de savoir que l'on rencontre parfois dans l'hydrargyrisme professionnel, un liséré bleu absolument identique d'aspect au liséré bleu du saturnisme. De même on rencontre des plaques de tatouage bleu à la face intérieure des joues tout à fait analogues à celles du saturnisme.

Il est, au reste, assez remarquable de constater que ce liséré mercuriel n'existe que chez les ouvriers et ouvrières coupeurs, brosseurs et souffleurs de poils. Jamais l'auteur ne l'a observé chez les secréteurs. Ces derniers ouvriers présentent en revanche un stigmate professionnel des plus nets; ce sont les dents noires mercurielles décrites par Letulle. Les dents sont d'un beau noir d'ébène et le revêtement qui recouvre leur émail est entièrement adhérent.

Système nerveux.—L'auteur n'a jamais eu l'occasion de rencontrer les troubles graves de l'intelligence et du raisonnement, la déchéance mentale profonde et la démence paralytique que l'on observe parfois dans les grandes intoxications qui frappent surtout les ouvriers des mines de mercure.

En revanche, chez les ouvriers des couperies de poils, le symptôme le plus fréquent de l'imprégnation profonde de l'organisme par le mercure, c'est le tremblement. On l'observe chez eux à tous les degrés. Certains ouvriers secréteurs observés au cours de l'enquête n'étaient pas moins atteints que les ouvriers des mines de mercure présentés à l'auteur par M. le Professeur Pierrachini dans sa clinique de Florence.

Le tremblement mercuriel est, on le sait, un tremblement intentionnel; des nombreux tracés de ce tremblement enregistrés par les inspecteurs-médecins du travail, il résulte par comparaison, qu'il se rapproche beaucoup du tremblement de la sclérose en plaques, mais avec cette différence qu'il atteint en général d'emblée toute son intensité, tandis que l'autre est à oscillations progressivement croissantes.

On a beaucoup discuté sur la nature du tremblement mercuriel que Charcot considérait comme une manifestation d'un état hystérique; que Raymond et Sicard déclarent être le résultat d'une réaction lymphocitaire, et qu'enfin Lereboullet et Lagave rattachent à une triple influence: toxique, organique et pithiotique (besoin d'imitation).

Les paralysies hydrargyriques sont le plus souvent incomplètes; elles se bornent presque toujours à de la parésie, de l'engourdissement des membres.

Les réactions hématiques de l'hydrargyrisme professionnel sont des moins nettes: elles n'ont rien de caractéristique. Les lésions

décrites par Agasse-Lafont et Heim ne sont ni spéciales ni constantes.

Nos observations personnelles ne nous permettent que les affirmations suivantes: la colorabilité, la forme, les dimensions et la résistance à l'hémolyse des globules rouges sont normales; le nombre des globules rouges est diminué.

Le nombre absolu des globules est normal, la formule leucocytaire indique une mononucléose fréquente et parfois considérable, mais on doit se souvenir que cette constatation est banale dans un très grand nombre d'états pathologiques.

Parmi les phénomènes généraux qui surviennent assez souvent à la suite de l'hydrargyrisme, il convient de signaler les complications redoutables d'une néphrite (habituellement parenchymateuse).

Le moyen d'assainissement—la prophylaxie.—Nous ne nous arrêterons pas à énumérer les procédés qui ont été mis en avant pour substituer au secrétage au mercure un procédé moins nocif. Etant donné le prix élevé du mercure, on conçoit que ce problème ait éveillé l'attention de bien des chercheurs; aussi, les brevets pris en vue de l'exploitation d'un "secret sans mercure" sont-ils nombreux. Bornons-nous à cette constatation plutôt fâcheuse: tous les coupeurs de poils déclarent l'usage du mercure indispensable.

Dans ces conditions on ne peut songer qu'à l'emploi de moyens palliatifs. Parmi ces derniers signalons, à titre d'exemple, la mise en usage assez prolongé dans un établissement de Belgique d'une machine à secréter; il est regrettable que des raisons économiques aient fait abandonner l'emploi de ce procédé mécanique qui, au point de vue de l'hygiène, constituait un progrès réel.

On trouvera ci-dessous condensées sous la forme d'un règlement les prescriptions d'hygiène qui ont paru les plus recommandables dans la situation actuelle de l'industrie et de la législation en Belgique. Ce règlement promulgué ces jours derniers sous la forme d'un arrêté royal se caractérise par les points suivants:

1°. En fait, il interdit à domicile les opérations qui précèdent le secrétage, puisqu'il exige, dans les locaux où elles s'effectuent, l'existence d'une ventilation mécanique.

Cette interdiction se justifie par les circonstances suivantes: les opérations dont il s'agit, sans être très insalubres, sont désagréables et sales; il ne convient donc pas de les tolérer dans les locaux d'habitation sans raisons sérieuses. Or, les industriels belges ont unanimement déclarés qu'ils ne s'opposaient point à cette interdiction réclamée avec instance par les divers groupements ouvriers.

2°. Le coupage des "chiquettes" à domicile n'est toléré que pour autant que celles-ci ne soient point secrétées au mercure.

Cette mesure s'explique par les considérations que voici: unanimement les chefs d'entreprise déclarent qu'il leur sera très difficile de

se passer du travail à domicile pour le coupage des "chiquettes." Les ouvriers de leur côté ne réclament pas cette interdiction.

D'autre part, il n'est pas admissible qu'on tolère la manipulation de matières toxiques dans les chambres d'habitation et moins encore, comme l'auteur l'a vu, sur la table même où des enfants prenaient leurs repas.

Dorénavant la situation à cet égard sera donc la suivante: la majeure partie des "chiquettes" seront encore coupées à domicile, et l'autre partie, beaucoup moins grande, sera coupée dans les usines, soit à la main, soit au moyen des machines spéciales qui, depuis un certain temps, commencent à se vulgariser.

Toutes des autres mesures prescrites s'expliquent d'elles-mêmes, et il suffit de les énumérer pour en démontrer les avantages hygiéniques.

Notons cependant, avant de donner le texte du nouvel arrêté royal, que la législation sociale belge permet d'imposer l'observance des règles de l'hygiène aussi bien aux ouvriers qu'aux chefs d'entreprises:

ARRÊTÉ ROYAL PRESCRIVANT DES MESURES SPÉCIALES À OBSERVER DANS L'INDUSTRIE DE LA COUPERIE DE POILS.

ALBERT, Roi des Belges.

A tous présents et à venir, Salut.

Vu les arrêtés royaux du 29 janvier 1863, du 27 décembre 1886 et du 31 mai 1887, concernant la police des établissements classés comme dangereux, insalubres ou incommodes;

Vu les arrêtés royaux du 23 avril 1900 et du 5 mars 1912, fixant respectivement les rubriques sous lesquelles les dépôts de peaux ainsi que le travail des peaux et des poils sont inscrits dans la nomenclature des établissements classés;

Vu les arrêtés royaux du 21 septembre 1894 et du 30 mars 1905 prescrivant les mesures générales à observer en vue de protéger la santé et la sécurité des ouvriers respectivement dans les établissements classés et dans les entreprises industrielles et commerciales assujetties à la loi du 24 décembre 1903;

Vu l'avis du Conseil supérieur d'hygiène publique;

Considérant qu'il convient, dans l'intérêt de la salubrité publique et de la santé des travailleurs, de prescrire des mesures spéciales à observer dans l'exécution des travaux prévus sous les rubriques de classement susvisées, indépendamment des obligations fixées par les règlements généraux et des conditions que l'autorité compétente conserve le droit d'imposer dans chaque cas;

Sur la proposition de notre ministre de l'industrie et du travail, Nous avons arrêté et arrêtons:

"ART. 1. Dans l'industrie de la couperie de poils, l'emmagasinage, le nettoyage, le fendage, le dégalage, le carreletage, l'éjarrage, l'ébarbage, le secrétage et le brossage des peaux de même que le coupage et le soufflage du poil, sont soumis aux prescriptions suivantes:

"SECTION I.—*Mesures imposées aux chefs d'entreprise.*

"ART. 2. Les dépôts de peaux, de rognures de peaux (chiquettes), de queues ou de poils, ainsi que tous les locaux où se manipulent ces matières, seront distincts des locaux d'habitation.

"Art. 3. Le chef d'entreprise mettra gratuitement à la disposition des travailleurs un vêtement de travail constitué par une longue blouse s'adaptant bien au cou et aux poignets, une coiffure protégeant convenablement la tête ainsi que les objets de protection nécessaires contre l'action nocive des acides et des instruments de travail.

"Art. 4. Par les soins du chef d'entreprise, les vêtements de travail seront maintenus en bon état et lavés au moins chaque semaine.

"Art. 5. Un local distinct des ateliers servira de vestiaire. Chaque ouvrier y disposera de deux porte-manteaux, l'un pour ses vêtements ordinaires, l'autre pour ses vêtements de travail.

"Art. 6. Indépendamment de ce qui est prescrit à l'article précédent, les ouvriers employés au secrétage ainsi que le personnel occupé aux manipulations de peaux ou de poils secrétés disposeront, dans un local approprié, d'eau salubre de savon et d'essuie-mains propres. L'installation comprendra un verre à boire et un essuie-mains numérotés par ouvrier et une cuvette ou prise d'eau par deux ouvriers.

"Le chef d'entreprise prendra les mesures nécessaires pour qu'avant chaque repas et avant toute sortie de l'établissement les ouvriers visés au premier alinéa du présent article quittent leurs vêtements de travail, se lavent convenablement les mains et la figure, se rincent la bouche et enlèvent la poussière de leurs cheveux.

"Art. 7. Un local servant de réfectoire sera tenu à la disposition des ouvriers qui prendraient leurs repas à l'établissement. Ce local sera distinct des ateliers; il contiendra des tables, des chaises et un appareil pouvant servir à réchauffer les aliments.

"Art. 8. Les installations hygiéniques visées aux articles 5, 6 et 7 seront maintenues très propres, en bon état, bien ventilées et chauffées à une température de 18 degrés au moins.

"Art. 9. Il est interdit: 1° d'employer des ouvriers s'adonnant à l'ivrognerie; 2° de laisser introduire dans l'établissement des boissons alcooliques distillés; 3° de laisser déposer des aliments, manger ou boire, ailleurs qu'au réfectoire.

"Art. 10. La préparation et la conservation des solutions destinées au secrétage seront effectuées de manière à éviter que les vapeurs acides puissent incommoder les ouvriers.

"Art. 11. Les ateliers de secrétage seront munis d'une ventilation mécanique localisée aspirant les vapeurs acides aussi près que possible de leurs lieux de production.

"Le revêtment des murs de ces ateliers jusqu'à hauteur d'homme, le sol et les tables à secréter seront imperméables et nettoyés à grande eau au moins une fois par semaine.

"Art. 12. Les étuves destinées au secrétage ne pourront communiquer directement avec les locaux de travail et les mesures voulues seront prises pour que les vapeurs qui s'y produiront ne puissent se répandre dans ces locaux.

"Les étuves seront pourvues d'un dispositif tel que l'ouvrier ne soit pas obligé d'y pénétrer pour introduire ou retirer les peaux.

"Il est interdit de laisser pénétrer les ouvriers dans une étuve de secrétage insuffisamment ventilée.

"Art. 13. Tous les locaux dans lesquels s'effectuent les opérations qui précèdent le secrétage et ceux dans lesquels se manipulent les peaux, les rognures de peaux (chiquettes), les queues et les poils après le secrétage au mercure, seront pourvus d'une ventilation mécanique efficace.

"Pour le brossage des peaux secrétées, on installera, en outre, une ventilation mécanique localisée au lieu de production des poussières.

"Les dispositions du premier alinéa du présent article ne sont pas applicables aux locaux où se pratique exclusivement le coupage à la main des chiquettes, rognures et queues non secrétés au mercure.

"ART. 14. L'air ayant parcouru les machines à souffler le poil secrété sera évacué directement à l'extérieur.

"ART. 15. Le personnel employé à la préparation du secret, au secrétage et à la manipulation des peaux ou des poils secrétés, sera examiné trimestriellement par un médecin agréé par le Ministre de l'Industrie et du Travail. Les frais de ces examens, tarifés par arrêté ministériel, incombent aux patrons.

"Les ouvriers atteints d'hydrargyrisme seront écartés des travaux qui exposent à l'empoisonnement. Il en sera de même de ceux dont l'état général serait mauvais au moment de l'examen.

"Il sera tenu un registre spécial, conforme au modèle délivré par l'administration, sur lequel le médecin agréé consignera les constatations faites au cours de ses examens.

"Ce registre sera remis aux agents de l'autorité à chaque réquisition.

SECTION II.—*Mesures imposées aux ouvriers.*

"ART. 16. Les ouvriers devront faire usage des vêtements de travail mis à leur disposition ainsi que des objets de protection nécessaires contre l'action nocive des acides et des instruments de travail.

"ART. 17. Les ouvriers ne pourront déposer leurs vêtements qu'au vestiaire.

"ART. 18. Avant chaque repas et avant toute sortie de l'établissement, les ouvriers employés au secrétage de même que le personnel occupé aux manipulations de peaux ou de poils après le secrétage sont tenus de quitter leurs vêtements de travail, de se laver convenablement les mains et la figure, de se rincer la bouche et d'enlever la poussière de leurs cheveux.

"ART. 19. Dans les établissements soumis aux prescriptions du présent arrêté, les ouvriers ne peuvent déposer des aliments, manger ni boire, ailleurs qu'au réfectoire.

"Il est interdit aux ouvriers d'introduire ou de consommer dans ces établissements des boissons alcooliques distillées.

"ART. 20. Les ouvriers sont tenus de se prêter aux examens médicaux prévus à l'article 15 du présent arrêté.

SECTION III.—*Dispositions générales.*

"ART. 21. Les articles 3, 4, 5, 7, 17, et 19 ne sont pas applicables aux travaux effectués exclusivement par les membres d'une famille occupant la même habitation.

"ART. 22. Les chefs d'entreprise sont tenus de faire afficher dans leurs ateliers, à un endroit apparent, les dispositions du présent arrêté.

"ART. 23. Les inspecteurs du travail et les délégués à l'inspection du travail sont chargés de surveiller l'exécution du présent arrêté.

"La constation et la répression des infractions auront lieu conformément à la loi du 5 mai 1888, relative à l'inspection des établissements dangereux, insalubres ou incommodes.

"ART. 24. Notre Ministre de l'Industrie et du Travail est chargé de l'exécution du présent arrêté qui entrera en vigueur trois mois après sa publication au *Moniteur*."

Donné à Ciergnon, le 10 août 1912.

ALBERT.

Par le Roi:

Le Ministre de l'Industrie et du Travail,
ARM. HUBERT.

LEAD POISONING IN THE UNITED STATES.

Dr. Alice Hamilton, Hull House, Chicago, Ill.

When one tries to compare the lead industries of the United States with those of any European country, in respect to the incidence of lead poisoning among the workmen, one is confronted with the lack of statistical information in our country, and the comparison can not be made with any real completeness except in the case of a few trades which have been intensively studied by the Federal Bureau of Labor. There are, however, some broad comparisons which can be made and which show that in certain respects the United States has the advantage over European countries, and that, in other respects, the reverse is true.

To speak first of the points in which the advantage is on our side, I may mention some industries which give rise to lead poisoning in European countries, but, owing to differences in the processes used, are quite harmless in the United States. File making and jewel polishing are notoriously dangerous trades in Europe. They are not lead trades here. The making of cheap kitchen ware is a bad lead trade in England. Our ware is made of iron covered with an extremely thin coating of tin, not of lead and tin. Our cut glass is rarely polished with putty powder containing red lead, because the more rapid process of finishing with hydrofluoric acid is taking the place of that. The fact that lead pigments are relatively expensive has led to a search for cheap substitutes, and we find a very general use of aniline greens and yellows instead of cromate of lead in American textile works, paper factories, and in the making of artificial flowers. As for lead paints, graphite is used more and more to cover metal surfaces in place of red lead, and it is probable that lithopone and sulphate of lead often mask as lead carbonate in mixed paints, but as to this it is hard to speak authoritatively. In the rubber trade it is admitted that lead carbonate has been largely abandoned for the less poisonous sulphate. Whatever may be felt as to the effect of such substitutions on the value of the product, there can be no doubt that the producer—the workman—profits greatly by the use of relatively nonpoisonous substances in the place of poisonous.

On the other hand, there are lead trades which are distinctly more dangerous in the United States than in Europe. In our railway, coach, carriage, and automobile factories there is a great deal of rubbing with sandpaper in order to prepare the already dry coat of lead paint for the reception of the second coat. This work is often done in closed rooms and no attempt is made to draw off the poisonous dust. Our white lead industry is attended with dangers such as do not exist in the same industry in Great Britain and Germany, although the process used here can be seen also in Belgium. Another

industry more dangerous here than in England is the making of storage batteries, or electrical accumulators. In all such factories that I have visited in the United States a mixture of oxides of lead and other ingredients is given in dry form to the workmen, each of whom must make up his own paste. In the British factories I visited the paste was made in the mixing room and given out to the workmen. The comparative freedom from dust of the English method is obvious.

It is probably true that in some of the lead trades living conditions are better here than in the same trades in Europe. The potters in New Jersey and Ohio who belong to the organized branches of the trade consider themselves as better off than their relatives in Staffordshire. The Slavic enamelers in the sanitary ware factories of Pennsylvania, Illinois, and Wisconsin live better than they did in Austria-Hungary. On the other hand, the lead smelters, with the exception of the open hearth men, are usually non-English-speaking, nomadic foreigners, poorly paid and wretchedly housed. A comparison between a large smelting plant in southern Illinois and one in Ems would show that the German workman is better off in every respect than the American.

Ignorant and more or less neglected foreigners also man our white-lead works and storage-battery works, and swell the ranks of the unorganized painters and printers, who take employment in the worst of the workshops and have the more dangerous kinds of work to perform. They are the painters who are found sandpapering dry white-lead paint in railway and carriage shops; they are the printers who found and set type by hand in tiny, dirty printing shops.

The presence of these groups of non-English-speaking foreigners in many of our lead trades gives rise to a condition which is not found, so far as I can ascertain, in any lead trade in Great Britain, though apparently it exists and is recognized as a danger in some of the remoter lead-smelting works in Germany. To illustrate it I might describe a large lead-smelting plant in southern Illinois. With the exception of a small number of skilled American workmen, this place is manned by Greeks, Macedonians, Bulgarians, a few Slavs from Austria-Hungary, and by negroes. The men are housed in filthy shacks, and are poorly paid. In consequence they are so shifting a body of workmen that it is sometimes necessary to arrange beforehand with the employment agencies of Chicago and St. Louis for almost 50 per cent of new men to take the place of those who will leave on the semimonthly pay day. Up to 18 months ago there was no law compelling the owners to do anything for the protection of their men against lead poisoning, and, naturally, neither employers nor foremen took much interest in a gang of foreigners whose very names they did not know, and whom they expected to lose in a few

weeks' time. To trace cases of lead poisoning among these men was impossible. A sick man might go to the nearest doctor, who would make no attempt to learn his name or address; or he might land in a hospital in St. Louis, where they would not trouble to ask where he had been working; or he might go up to Chicago to find a doctor of his own nationality; or join a railway gang in the far West, in the hope of regaining his health in outdoor work. Nobody knew what became of him. Between him and the prosperous American town, a mile or so away, there was absolutely no connecting link, except a long line of saloons with foreign names over the doors.

Even if the community is a stable one, the fact that it is foreign adds greatly to the difficulties of an investigation and undoubtedly to the difficulties of an employer who wishes to enforce hygienic measures. In a certain white and red lead factory, practically 90 per cent of the employees are Poles and Italians. It is impossible to verify a case of reported lead poisoning among these Poles. Their rooted suspicion of all governmental supervision leads them to conceal even their names and to instinctively cover up their tracks. They will give one name to their foreman, another to the hospital, and their real name will be known perhaps only to the family and the priest. Italians are not so suspicious, yet they, too, are hard to trace. A man who is known as Dago Jim in the factory may be Vincenzo Cosenza to the neighborhood, because he came from Cosenza, while the hospital record will have his real name, Vincenzo Perrone.

The greatest disadvantage, however, from which the lead industries in the United States suffer, as compared with the same industries in Europe, is the almost total absence of laws governing the hygiene of the lead trades. This does not mean that all our factories in which lead is used are more dangerous than are the European factories, for in many instances benevolent employers have tried, and, in a few instances, employers at once benevolent and intelligent have succeeded in so constructing and managing their works as to bring them up to European standards. But while some American factories are larger, better constructed, and more lavishly equipped than any I have seen in Europe, the evils arising from the lack of industrial legislation are seen in a large number of factories, which are poorly constructed and carelessly managed to a degree that would not be tolerated in Europe. Even in those which are under careful, conscientious supervision, one sees evidences of the need of expert direction, such as can only be given by men versed in industrial hygiene.

In this brief review of the lead trades in the United States, as compared with the same trades in Europe, the impression must be left on your minds that such advantages as we possess, in the way of

higher wages, where these exist, and the comparative absence of women and young people, are more than offset by the great disadvantages which come from the employment of non-English-speaking, nomadic workmen, at a low wage, and from an almost total lack of legislative control of these industries. That this impression is correct, that we have more lead poisoning in the United States than is to be found in the corresponding industries in Europe, is apparently true of the three lead trades which have been intensively studied by the Bureau of Labor.

In two of these, the white-lead industry and the making of porcelain-enameled sanitary ware, we have to do with industries in which the processes used here are decidedly more dangerous than those used in most European factories. In the making of old Dutch process white lead the American method is to separate the carbonate from the uncorroded lead by grinding, crushing, and screening it dry, and therefore we can not wet down the white beds before stripping, as is required by law in England and Germany. It follows that stack stripping and the conveying and separating of cores and corrosions is much dustier work in an American factory than it is in a British or a German factory. Besides this, we dry our final product, the suspension of white lead in water, in great open tanks, and the dry powder is shoveled from these tanks and thrown into open wagons. This work is recognized everywhere as very dangerous, and efforts are made in several plants to control the dust, but the very best of these is not as safe as any of the English and German factories I have visited. It would not be fair to give the figures from the bureau reports as to lead poisoning in this industry, for during the months that have elapsed since its publication, great improvements have taken place in white-lead works, and it is probable that lead poisoning has diminished remarkedly.

It is harder to compare the second industry, the making of porcelain or vitreous-enameled sanitary ware, in the United States with the same industry in Europe. In Germany this is not a lead trade at all. German cast-iron sanitary ware is covered with a leadless enamel. In Great Britain this is also true in many factories, and though it was not easy to learn very much about this particular trade, yet it is certainly true that the making of this ware is not a dangerous lead trade in Great Britain. The report of the chief inspector of factories and workshops for 1910 gives only 17 cases of lead poisoning in workers in vitreous enameling plants during this year, and from interviews with inspectors, I learned that by far the greater number of these people were not employed in sanitary ware establishments, but in the making of signs.

In the United States this is a large industry. The 10 plants which were investigated by the Bureau of Labor employ over 1,000 mill

hands and enamelers on their regular force, and many more in the course of the year, for the mill hands are unskilled laborers, who shift all the time. Out of 45 who were questioned only 16 had worked more than a year. Even the enamelers, skilled workmen, employed for shifts of never more than eight hours, often only six, and well paid, do not remain long in the trade; 250 of them averaged only six years' employment.

The reason for this is easy to understand, for it is an occupation which makes tremendous demands on physical endurance. For those who are not familiar with this sort of work I will give a short description of it as it is done in all American and in some British factories. I saw the same processes in an Austrian factory where porcelain-enameled gas stoves are made.

The enamel used is essentially a ground glass containing anywhere from about 2½ to 20 per cent of soluble lead by the Thorp test, according to the report given by the Government Bureau of Chemistry. The mixing of this enamel is dangerous work, and is done by unskilled foreigners or negroes under the direction of a chemist. Some of these laborers know they are working with poisonous stuff, because they have seen men who were affected by it, but others are quite ignorant of the risks of the work.

The men who apply the enamel are skilled, well paid, and intelligent men. They work usually in large, well-ventilated rooms, and rarely more than eight hours a day. The bath tubs, sinks, basins, and so forth, which are to be covered with enamel come from the sand-blasting department to the slushers, whose duty it is to paint them over with the slush or ground coat. If the room in which this is done is separate from the enameling room, the work is harmless, for the ground coat is liquid and has only traces of lead, if any, but generally the slushers work at one end of the enameling room, or in a room opening directly out of it, and full of enamel dust. After the ware has had the slush coat, it is handed over to the enameler and his helper, usually a grown man, who puts it into the furnace until it is red hot, then it is brought out and placed on a turning table in front of the furnace door. The helper turns the ware at different angles, while the enameler shakes over it the powdered glaze from a dredge. This process of heating and enameling must be repeated several times, the ware being returned to the furnace after each coat, and then brought out for another coat. Large ware must remain several minutes in the furnace, and in this interval the men can go over to the windows to cool off or sit down and rest. Work on small ware is more nearly continuous, for it is heated more quickly, and it is a question among the men which is the dustier and more strenuous task. On the one hand, small ware does not take so much enamel.

nor so much strength to handle, but, on the other hand, there are many more pieces to be done.

In putting on the first coat, the enameler can stand at a distance from the ware, about 4 feet from the small, and 7 or 8 feet from the large ware, but the last coat must be put on very carefully, so that no uneven places shall remain, and for this the man must come up closer, as close, indeed, as the heat permits. After the ware is done, it is gone over by an especially skillful enameler who looks for the defective spots, and these men may sometimes be seen dusting enamel by hand over imperfectly covered ware.

Illinois is the only State which requires, in establishments using dry-lead enamel, any precautions for the care of the men other than those required in ordinary workshops. The men in the mixing rooms, mill rooms, and enameling rooms have no place to hang their street clothes away from the lead dust, and no place to keep or eat their lunch. Several times the wives of these men spoke of finding the white dust in their husbands' lunch boxes. The mill men may go out into the yard for lunch, or go home, but the enamelers are doing piecework, and lose money if they stop work to eat. Moreover, the furnaces are running continuously, and the men are not expected to let them run at a loss to the factory. The managers who were interviewed said that the men were supposed to work steadily during the six or eight hours of their shift, except for the necessary pauses while the ware was heating. Consequently, the men either eat no lunch at all, many saying that the heat or the enamel destroys their appetite, and that they do not care for lunch, or they take a bite now and then while the tubs are heating. I have often seen a man open his lunch box and take out some food while the ware was heating, lay down his sandwich anywhere (there is no dust-free place), go back to his work, and then return in a few minutes to finish eating. Of course, washing the hands and face before lunch is out of the question, because there is no time for it. In some factories the drinking water stands in open pails in the enameling room.

The men who handle small ware do not have to make great physical efforts to get it in and out of the furnaces, but the bathtubs require all the men's strength, even with the help of the mechanical appliances now found in all factories. The excessive heat is exhausting, especially in summer, and the men's wives speak of their husbands coming home on warm days weak, exhausted, and soaking wet. In some factories the hours are shortened in summer, and four shifts are employed instead of three, in order to spare the men and to increase the output, but in other factories the long shift comes during summer and the short shift is introduced in winter, when the work is slack.

The elements of heat and overfatigue in this trade bid fair to grow worse rather than better, because of the introduction of double fur-

naces in place of the single furnaces. These furnaces are kept at a somewhat lower temperature, so that the enamel does not fuse quite so quickly, and one man can tend both, for while he is dredging enamel on one piece of ware the other is heating, and by the time the first is ready to go into the furnace the second is ready to come out. This makes the work practically continuous. There are no intervals here for strolling to the windows to get a breath of air or sitting down to rest. Even when the hours are shortened from eight to six the man on the double furnace finds his work more exhausting than it was on the single. It is said that the adoption of these double furnaces will probably be general.

To summarize, then, we have in our sanitary-ware factories men working in great heat, subject to excessive physical strain, and exposed for the larger part of their six or eight hours' shift to clouds of dust which contain soluble lead. It is easy to see that this is a very dangerous lead trade. The full amount of injury for which the enamel dust is responsible will not be known until a study has been made of pulmonary tuberculosis among these men, as well as of lead poisoning, but so far we have information only about the latter. The figures I give were gathered, as such information must be, in cities where there is no legal requirement for physicians to report cases of lead poisoning, and where the working class is composed largely of more or less shifting Slavic immigrants. Hospital records and physicians' notebooks yielded, for the year 1911, records of 191 cases of lead poisoning in a force of 1,012 men, or one for every five men employed. That this number falls below the truth, that the proportion of men with evidence of plumbism is even greater than this, was shown by the physical examination of 148 men who were out on strike, but who had been working up to a few days before the examination was made. Fifty-eight of the 148 had positive symptoms of chronic plumbism and either the blue line or extreme gingivitis obscuring the line; 15 had characteristic symptoms, but no line; 19 had a well-marked line, but either denied ill health or had symptoms not entirely typical. Only 56 had no line and no definite symptoms. There were, therefore, 39 per cent of positive cases and 38 per cent of negative, with 23 per cent suspicious. These men averaged a little over five years' employment; they were all Slavs, many of them powerfully built peasants who had not known a day's sickness until they entered this trade.

The form which lead poisoning takes among these enamelers is sometimes very severe. Out of 177 case histories which were obtained there were 28 cases of palsy and 8 of encephalopathy. The mortality from lead poisoning, as reported by physicians, averaged for two years 3.4 per 1,000 employed, which is more than three times as great as the mortality among English potters.

The rapidity of poisoning is not as great among enamelers as among men engaged in making white lead. Of 120 cases of lead poisoning in the latter industry 89 men, or 74 per cent, had worked less than one year. Among 94 cases in bathtub enameling only 48 per cent had worked less than one year.

The one English sanitary-ware factory in which I saw this sort of work done with a similar enamel employs 24 men in the mill room and as enamelers. The records of the physician who examines these men once a month show that they average one case of lead poisoning in two years' time. I hesitate to make a comparison on the basis of this one factory, and yet there must be some reason for the great contrast between these figures and those given above. Perhaps I might select as a fair basis for comparison a group of 21 enamelers and mixers from one of the two American factories mentioned above where the men were out on strike. A physical examination of these 21 men showed evidences of chronic plumbism in 7, 4 more had the lead line, 4 were in ill health dating from the beginning of their employment, 6 only were positively free from any sign of lead absorption. In other words, the English factory has one case in two years among 24 men, while the American factory has at least 7 in one year among 21 men.

It is probable that the difference between the American and the English factories is not to be found in the proportion of lead used to make the enamel, but in the sanitary control exercised over the men. The English mill hands and enamelers are given proper working clothes, caps, face cloths, and every facility for personal cleanliness, and are obliged to avail themselves of these provisions. They are given time for lunch and are required to wash before they enter the lunch room, the only place where they may keep or eat food. Once a month a physician examines each one for signs of lead absorption. The American workman is not given any of these safeguards. No working clothes or caps are provided, the men usually make a complete change from their dusty clothes when they leave work, but this is not always true. Some of the foreign workmen are said to wear their shirts home, if not their trousers, and in one plant which was visited on a very cold day the helpers were boys between 14 and 16 years of age, who were wearing good new sweaters at work, and there is no doubt that these same sweaters were worn in the street and at home.

If a physician is attached to the factory he is summoned only for accidents, or in case a man is seized with severe colic or convulsions while at work.

The pottery industry is the third lead trade which has been investigated by the Bureau of Labor. It is not as important an industry in our country as are the ceramic industries of Great Britain and

of Germany. While in the former 6,865 men and women are engaged in occupations exposing them to lead, only 1,500, less than one-quarter, are employed in the American potteries which were investigated by the Bureau of Labor, and which represent over three-fourths of the industry. Pottery making came to the United States from Staffordshire, and is still a trade ruled by English traditions and manned by men of British birth or parentage. This fact has had its influence upon the sanitary control of the trade. The Staffordshire men, who are potters, foremen, and employers in the United States, remember the industry as it was in England when they learned it in their boyhood, and, knowing as they do, that their potteries in New Jersey and Ohio are a vast improvement over the Staffordshire potteries of several decades back, they refuse to believe that there is anything wrong with the trade in this country, or that lead poisoning can be nearly as serious here as in England. They have not kept up with the improvements which have taken place in England, and have no idea how far they are lagging behind the old country.

Yet, with less than one-quarter of the working force, our American potteries have almost twice as many cases of lead poisoning in a year's time as have the British potteries. In 1910, Great Britain had 77 cases in a force of 6,865; in 1911, we had 144 cases in a force of only 1,500. The figures for Great Britain are 1 man poisoned out of 112 employed; for America, 1 man out of 12 or 13; for Great Britain, 1 woman out of 63 employed; for America, 1 woman out of 7.

Although the number of cases of lead poisoning is much greater in this country, yet apparently the more serious forms of the disease are not so frequent here as in England, and this may be one reason for the popular belief that lead poisoning is worse in Staffordshire than in Ohio and New Jersey. Cases of encephalopathy are rare, except in the tile works, and cases of blindness almost unknown. The mortality from lead poisoning is less than one per thousand. Dr. T. M. Legge has classified the cases of lead poisoning among British potters for five years according to the severity of the disease. If we follow his scheme, an analysis of 86 histories of male cases in American potteries would give only 8 per cent of the severe form as compared with Legge's 19 per cent. The female cases, however, correspond more closely to the English.

British authorities insist that there is a true sex susceptibility to lead poisoning, that women are more prone to it than men, and that they are more likely to have the severer nervous manifestations. The cases of encephalopathy found in this investigation among pottery workers confirm the latter statement, for 9 out of 14 collected cases and all of the 3 fatal ones were women. At first sight it would

seem that the results of the investigation bear out also the statement that women are more susceptible to lead poisoning than men, for there were 57 cases among 400 women, or 1 to 7, and only 87 among 1,100 men, or 1 to 12 or 13, but a closer analysis shows that there are factors influencing this difference other than the factor of sex.

In East Liverpool and Trenton, the relative proportion of male and female cases is even more strikingly in favor of the men than is the proportion given in the British reports; 795 men had 39 cases, which is 1 to every 20 or 21, and 150 women had 29 cases, or 1 to every 5 or 6 employed. But these are the districts where white ware is made; that is, table and toilet ware, and sanitary earthenware, and the men employed in these branches are strongly organized. As compared with the men, the women here have many handicaps aside from that of sex idiosyncrasy. They are unorganized, poorly paid, poorly housed and fed, subject to the worry and strain of supporting dependents on a low wage, fearful of losing their employment, while the men are prosperous and independent. In the unorganized pottery fields, however, in the tile works and art potteries, men and women are in the same economic class, all making low wages with everything that that implies, and here no such disproportion is found in the incidence of lead poisoning in the two sexes. In the establishments that were studied there were, in 1911, 305 men employed, and there were 48 cases of lead poisoning, or 1 for every 6 to 7 men. Two hundred and forty-three women were employed, with 28 cases, or 1 for every 8 or 9. The ratio is actually greater among the men. Of course, I offer these figures very tentatively, for I know that they can in no way be compared with the British reports, which are based on a medical examination of all men and women employed, and on accurate records as to the number of employees during a year. My results can only be suggestive. I give them because the contrast between the proportion of male cases in the unionized branches of the trade and that in the nonunionized branches seems too great to be accidental.

One reason for the discrepancy between these results and the British statistics may be found in the fact that many of the lighter cases of plumbism in women and girls were not reported to me by physicians. I was told by some of them that while they saw more men with the typical gastric form of lead poison, they saw large numbers of women and young girls with less pronounced and characteristic symptoms, which were probably, they supposed, attributable to the lead, such as profound anemia with constipation, and sometimes amenorrhea. It is more than probable that many of these cases were not reported to me, for the majority of physicians hesitate to speak of lead poisoning if there is no colic. The British reports, however, include just this class of cases: "Anemia of adolescence aggravated by employment."

I have had to limit my comparative study of the ceramic industry here and in Europe to one European country—Great Britain—because, though I have visited potteries in Germany and Austria, I have not been able to find statistics in those countries which would make it possible to state how large a proportion of the men and women exposed to lead in ceramic work suffer from plumbism. Austria has no compulsory notification of industrial lead poisoning. Prussia does not require it in this industry. Saxony does, but has not the system of periodical medical examinations of all lead workers as Great Britain has. Consequently, the cases reported in Saxony represent only the persons who voluntarily consult the sickness-insurance physicians. Moreover, there are no data available in Germany as to the number of ceramic workers who are exposed to lead, and therefore it is not possible to ascertain, even in Saxony, whether the number of cases of lead poisoning reported during one year from this industry represents a very small or a moderate proportion of the people employed. German experts assure me that the very lack of supervision of this industry shows that the amount of lead poisoning must be small; otherwise the attention of physicians would be called to it and a Government inquiry instituted. However this may be, it is not possible at present either to prove or to disprove such a statement.

One pottery I visited—the Dresden branch of Villeroy & Boch—has a very excellent record, as far as industrial plumbism goes. There are 200 persons regularly employed here in occupations exposing them to lead, and 15 more who work four or five weeks twice a year making up the glaze. During the last four years no case of lead poisoning in this factory has come to the notice of the sickness-insurance physicians.

As for the influence of sex, the general impression among the Germans who discussed the question with me was that there is relatively more lead poisoning among men in the ceramic trades than among women doing similar work.

The great falling off of industrial plumbism among British potters during the last decade is easy to understand when one visits English potteries and tile works. To a less extent is this true of the German potteries, which are usually larger and better constructed than the English, but in which one does not find the scrupulous attention to detail, the skillful devices for the prevention of glaze dust, and the strict supervision of personal cleanliness that are found in British potteries. American potteries are, for the most part, large, well lighted, and ventilated, but the workmen are not protected from lead dust. British regulations prescribe floors of impervious material, which are flushed with water at the end of the day's work; the German and Austrian potteries that I visited have

these also. American dipping rooms have wooden floors, worn rough, white with accumulations of glaze dust, almost never washed, and swept after a perfunctory sprinkling by girls or boys at the end of the day's work. British regulations require the employer to provide working clothes and caps; many German and Austrian employers do the same; no American does. European potteries are provided with lunch rooms away from the lead dust. I have never seen one in an American pottery or tile works, but I have seen many lunches eaten in the dipping rooms. Hot water, soap, towels, and nail brushes are provided by all British and by some German and Austrian pottery owners for the workers exposed to lead, but never by Americans. Even more disastrous is the carelessness as regards glaze dust in our potteries, especially in our tile works, where practically no attempt is made to minimize the dangers caused by dry glaze. In this respect the British potteries are admirable—better than the best German. It is needless to say that no American pottery owner thinks of having regular medical inspection of his work people.

If these drawbacks are somewhat offset in our white-ware potteries by the high rate of wages paid to the men, there is no such compensation for the women workers in white ware, nor for the men and women in majolica and yellow-ware potteries, and in tile works, where the rate of wages is extremely low.

I feel that I have been drawing a dark picture of American industry, and, indeed, it is hard to touch upon the subject of industrial hygiene without prevailing our striking neglect of this field of preventive medicine. I do not believe it means that we are harder hearted than Europeans, more indifferent to the fate of our working people. I believe it means only that we are vastly more ignorant. Ten years ago we knew practically nothing about the morbidity of our dangerous trades; now we are slowly beginning to learn, and the greatest need in the country at present is more knowledge on the subject. That action will follow fairly promptly upon such knowledge was shown by the passage of legislation on the use of poisonous phosphorus within a short time after the condition in our match factories had been made public. Another proof of our readiness to act was given by Illinois, which, within a few weeks of the appearance of her industrial diseases report, passed a law framed on British models for the control of occupations involving the handling of poisons, a law which met with no opposition from the owners of the great lead-smelting, white-lead, and dry-color establishments in Illinois.

The fact that such legislation is a matter for the separate States, not for the Federal Government, is sometimes looked upon as an obstacle, because it means placing some manufacturers under restric-

tions to which their competitors are not subject; yet, in another way, this is an advantage, for one State may venture upon experiments in legislation which the country as a whole is not yet ready to try. It is to be hoped that Illinois will be able to show the other States of the Union that laws controlling the poisonous industries are a benefit, not only to the workmen, but to the industry itself.

INDUSTRIAL LEAD POISONING AND SOME OF THE PROBLEMS IT RAISES.

Sir Thomas Oliver, M. A., M. D., LL. D., D. Sc., F. R. C. P., Newcastle-upon-Tyne.

In my own country the workmen's compensation act has given a fresh impetus to the study of industrial lead poisoning, but more especially to latent plumbism and to the less well-known forms of the malady. As an affected workman is entitled to compensation, the burden is thrown upon him of proving that he has contracted lead poisoning. The liability for the malady rests upon the employer in whose service the workman was last engaged during the 12 months previous to the development of the illness. As such a workman may have been employed in more than one factory during that period, the workman must furnish to the aggrieved employer the names and addresses of all employers with whom he worked during the particular 12 months, since for lead poisoning, which is a disease of gradual development and the date of its onset unknown, the liability has to be divided between various employers.

Where such symptoms as colic, vomiting, constipation, blue line on the gums, headache, and cachexia are present, accompanied or not by wrist drop, the diagnosis of plumbism is comparatively easy. The difficulty commences when there is a limited nerve disorder, such as muscular paresis, atypical brain symptoms, and a sense of malaise which is badly defined, where there is continuous headache, with or without albumin in the urine, no blue line on the gums, or only a doubtful one, and where no history of exposure is obtainable. Any assistance toward a diagnosis is welcomed. Several physicians are of the opinion that in basophile degeneration of the red blood corpuscles is to be found an important sign of plumbism. Basophilia to the extent of anything above 1 per cent is held to be characteristic of lead poisoning.

I can not say that I have found basophilia to be the assistance in diagnosis which Grawitz and other writers claim for it; nor is it a ready method, since it requires a certain amount of technical skill in the preparation of the blood film and familiarity with the microscopical appearances of the blood, which busy practitioners of medi-

cine do not always pretend to have. In a rabbit which took lead almost daily for nearly three years, I found no basophilia, nor did I find it present in the blood of a woman who nearly lost her life through having taken a large number of diachylon pills in order to procure abortion. Basophilia was present to the extent of 1 in 500 erythrocytes, or only 0.2 per cent, in another woman who nearly killed herself with diachylon pills, having in the course of a few days taken 144 grains of oleate of lead. In by far the largest number of my patients, basophilia was neither a constant nor a striking phenomenon; besides, it occurs in other diseases than plumbism. I consider the presence of lead in the urine to be of more assistance, from a diagnostic point of view, than basophilia, for although, like the blue line on the gums, lead is found in the urine of persons who do not exhibit symptoms of plumbism, yet its presence can not altogether be ignored. If the significance of the Burtonian line is that lead is present in the system, the finding of lead in the urine means that it is being eliminated. Lead because stored up in the body only when elimination fails to keep pace with absorption. On examining the urine of several lead workers, who at the time were following their occupation, lead was found in the urine of nearly all of them and, although most of the men were pale and did not look well, not one of them was ill. Within a few months two or three of these workmen were admitted into the infirmary under my care, some of them seriously ill with lead poisoning. Although where a blue line exists on the gums and lead is present in the urine, a man or woman may not exhibit symptoms of active plumbism, yet after events frequently show that at the time lead was being passed in the urine structural changes had already been established in the kidneys and nervous system which ultimately did bring about a fatal result. I found lead in the urine of some of my patients who had left the white-lead factory 2 to 17 years previously. In two of my female patients who had retired from the white-lead factory three years before coming under my care Prof. Bedson found 1 part of lead per million in their urine, and in ascitic fluid removed from the peritoneal cavity by paracentesis abdominis, 1.5 and 2 parts of lead per million. Data such as these indicate the length of time lead can lie stored up in the body and yet become at any time a source of danger to the individual.

These remarks raise the question, When is plumbism lead poisoning? Is it only when symptoms are complained of? Analogy may help us to answer this query by "When is a disease disease?" A man hitherto regarded as healthy is following his occupation, when, without premonitory symptoms, he rapidly becomes comatose and dies within a few hours. In his urine sugar is found, and the cause of death is diabetes. No one disputes the diagnosis. Beyond its

suddenly fatal termination the illness in no way differs from the more protracted type of diabetes, except in this respect: That had there been symptoms the patient could have been treated and the fatal termination probably postponed. The fact that there was no complaint, and that there were no symptoms, does not in the least alter the diagnosis. Is there not in this respect a close similarity between latent diabetes and latent plumbism? Take another illustration: There is no tuberculosis without the tubercle bacillus, but so long as the local and general resistance is greater than the influence exercised by the microorganism the patient may remain free from symptoms, unless it be an occasional cough with slight expectoration, and yet, while he himself does not complain, he, like a typhoid carrier, may be spreading the disease among other persons. If the maladies set up in other people by the microorganism given off by these bacilli hatchers are tuberculosis on the one hand and typhoid fever on the other, then surely the original carriers must be regarded as the subjects of the same diseases. Admitting this, it requires neither the utterance of a complaint on the part of an individual, the presence of symptoms, nor of active signs of a malady to be added to the existence of structural alterations of organs in order to constitute disease. In lead intoxication so long as elimination equals absorption no harmful result is perhaps noticeable. Should elimination fail storage will take place, but even then no symptoms of poisoning may be observed.

Experience shows that lead may be stored up in the tissues in an insoluble form and cause little or no inconvenience, but the individual is standing, nevertheless, on the brink of a precipice, over which he may be precipitated by a few grains of potassium iodide administered for some other illness. In my Goulstonian Lectures I mention how a maiden lady aged 72, to whom one day 7-grain doses of potassium iodide had been administered by her medical attendant for a recently developed paralysis of the eyeballs, was found dead in bed next day. At the autopsy no organic lesion of the brain was found. It subsequently transpired that the beautiful black hair of the lady, so much admired during her lifetime, was the result of the application of a lead dye. To the use of the hair dye the paralysis was probably due, just as death was the result of sudden flooding of the vascular system with lead products rendered soluble by the iodide of potassium. Another illustration may not be inappropriate, since the misadventure brought the case within the realm of the law and obtained for the relatives compensation under the workmen's compensation act. A man aged 50, previously a lead worker, but who had never exhibited symptoms of plumbism, was admitted to the Newcastle Royal Victoria Infirmary under the care of one of my colleagues, suffering from aortic disease, which was regarded as

syphilitic. At the time of his admission there was no blue line on the gums. Having in view only the aortic disease and its supposed causation, the physician in charge placed the patient upon potassium iodide, with the result that within a few weeks there appeared a blue line on the gums, double wrist-drop developed, progressive emaciation was started, and cerebral symptoms showed themselves. These were the prelude to a fatal termination which quickly came. All who saw the patient were of the opinion that he was suffering from plumbism, a diagnosis which was confirmed by finding lead in the urine. This patient, who was admitted into the infirmary and treated for another disease, developed and died from lead poisoning, lit up into an active form by iodide of potassium. When did this man's illness become lead poisoning? He had months previously given up work in the white-lead factory, he had never exhibited signs of the malady, while the treatment which was adopted for another complaint led to the manifestation of plumbism and death from it. Had the lead not been stored up in the tissue of this patient, there could not have been plumbism, and had iodide of potassium not been administered, the patient might have died from the malady from which he was suffering, viz, aortic disease. The case was taken into the county court, and the relatives were awarded compensation. The difficulty in regard to latent plumbism as well as to latent microbism and quiescent disease in general is that without some external signs or symptoms we have no means of knowing of its existence. In any doubtful or suspected case of plumbism, the urine ought to be examined for lead, but, having found it, does that circumstance alone constitute lead poisoning? Perhaps not, but it would at any rate be difficult to ignore the fact and to undervalue its meaning if present in the urine on successive occasions.

Once a person has suffered from lead poisoning he becomes, as a rule, on further exposure, increasingly susceptible to other attacks. Susceptibility to plumbism is more a trait in some persons than in others. This idiosyncrasy is personal, familial, and sexual. All young adult life, but especially young womanhood, is peculiarly impressionable to the harmful influence of lead. In plumbism anaphylaxis is the rule, but now and again we come across cases where it would almost appear as if contact with lead created for a period immunity to it. These cases are few, and in no way oblige me to change the attitude I have assumed in regard to plumbism, which is that no worker, who is exposed to lead in any form, can afford to trifle with the metal, or ignore the necessity for scrupulous personal cleanliness, when working in it. The reverse of this, that is to say, personal carefulness on the part of the workpeople and attention to industrial hygiene, is productive of good. Not only are these followed by a diminution in the number of persons who become ill,

but probably, too, by a reduction in the severity of the attacks. Fifteen years ago, when at the request of the home office, Sir Edward Thorpe and I were invited to inquire into, and report upon, the prevalence of lead poisoning in the manufacture of china and earthen ware, we found plumbism very prevalent in the Staffordshire potteries, and the type of the malady usually severe. A change in this respect has taken place. The district is no longer scourged as then. Dr. A. A. Hill,[1] certifying factory surgeon of Tunstall, maintains that a different type of lead poisoning is now met with in the potteries. The character and the severity of the attacks of lead poisoning have altered. He considers that the special rules have had most important results, as seen in the stamping out of the severe cases of plumbism, comprising lead encephalopathy, optic neuritis, and wrist-drop. It should be gratifying to every person interested in the pottery trade to learn that the terrible cases which gave the potteries such unenviable notoriety have considerably diminished. If the severe cases can be eliminated Dr. Hill maintains that the milder cases can, by early suspension, be kept in check.

One of the peculiarities of lead poisoning is, that its effects are not always confined to the individual contracting it. A pregnant woman who is the subject of plumbism may so poison her offspring that the child dies in utero and is stillborn, or the infant is born alive but dies shortly afterwards in convulsions. Another interesting point is, that plumbism is less frequently the result of the introduction into the system of one or of a few large doses of lead than of the repeated absorption of the metal or its compounds in small quantities over a considerable length of time.

Setting aside the skin as one of the surfaces through which lead may enter the body, the two principal channels of absorption are the alimentary canal and the respiratory passages. Of these two my own experiments suggest the alimentary canal as the more important. The large amount of lead found in the liver after death rather strengthens than weakens this statement. Notwithstanding this, it is upon the kidneys and the cerebrospinal system that lead mostly exerts its baneful influence. There is usually found in the brain and cerebellum a considerable quantity of lead.

When workmen have been exposed to lead dust, it is not always easy to say whether the metal is mostly absorbed by the alimentary canal or by the lungs. It is probably absorbed by both. When plumbiferous dust has been inhaled, the bulk of it is caught in the nares. The ciliated epithelial cells and the mucous membrane of trachea and bronchi prevent it readily reaching the lungs, but that it reaches the lungs is shown by the experiments of Laborde, who found that, in the case of guinea pigs exposed to an atmosphere in which white lead dust was suspended, the animals died within two

hours afterwards, and in the lungs there was found acute congestion of the lungs, with here and there minute hemorrhages. Similar lesions were observed when the experiments of a less severe type were conducted over a longer period, such as a few days. The contention of Dr. Kenneth Goadby, who is one of the strongest adherents of the respiratory absorption of lead dust, is to some extent, therefore, supported by the facts to which Laborde lends the weight of his authority. On the other hand, the more recent experiments carried out by Saito and Prof. Lehmann at the Wurzburg Institute of Hygiene show that, notwithstanding the primary channels of entrance, during breathing, only 12 per cent of the lead reaches the lungs and that about 70 per cent is found in the alimentary canal.

There is still considerable difference of opinion as to what takes place when men and animals who have breathed the emanations given from a surface freshly painted with white lead suffer in consequence. In my book, Diseases of Occupation,[2] I draw attention to the fact that, during the preparation and mixing of paints, peculiar symptoms are occasionally complained of by the men which are not altogether due to the white lead present, but to some peculiar condition of the linseed oil. Prof. Baly, of Liverpool, on spectroscopic examination of a beam of light passed through the emanations given off by a freshly lead-painted surface, was at first disposed to regard the harmful character of these exhalations as due to lead, but further experiments convinced him that, as similar emanations are given off by linseed oil mixed with manganese dioxide, they are due to unsaturated aldehydes, arising from hydrolysis of the linseed oil. These emanations are given off more readily from surfaces painted with white lead than where zinc white has been used. They vary with the percentage of linseed oil and they are given off in descending proportion according to whether white lead, sulphate of lead, or zinc white has been the compound added to the oil. Baly is therefore disposed to regard the aldehydes evolved from freshly painted surfaces as the harmful agents and not the lead. This, however, can only be partly true. That lead emanations are also given off is more than a probability, for only thus, among other reasons, can I explain the occurrence of severe colic, anemia, a blue line on the gums, and the presence of a small quantity of lead in the urine of a previously healthy young medical man recently under my care, who became seriously ill through living and sleeping at home when all his rooms were being painted. Besides, the experiments of MM. Heim and Hébert show that lead is present in the vapor given off from painted surfaces, and that to this circumstance the plumbism of house and coach painters is due.

Attention has been drawn in some of the medical journals to the occurrence of Wassermann reaction in plumbism. I found it positive

in a few of my lead-poisoned patients, both male and female, but in each instance there was not the least doubt that, in addition to lead, syphilitic infection at one time or another had also taken place and that the Wassermann reaction was related more to this circumstance than to the existence of plumbism. From what has been said in this paper of the unfavorable effects following the administration of potassium iodide, lead workers who are the subjects of syphilis run greater risks than their mates not similarly affected when both of them run the gauntlet of plumbism.

[1] Annual Report of the Chief Inspector of Factories, 1911.
[2] Diseases of Occupation. Methuen & Co., London.

INDUSTRIAL PLUMBISM.

Francis D. Patterson, M. D., Director Department of Sanitation and Accident Prevention, Harrison Bros. & Co., Philadelphia, Pa.

The axiom that an ounce of prevention is worth more than a pound of cure is nowhere truer than in the poisoning incident to the handling of lead and its soluble compounds.

Industrial plumbism is just as much a preventable as it is an occupational disease, and this prevention can be accomplished:

First. By taking care to make the processes as dust free as possible.

Second. As it has been found difficult to enforce the use of the ordinary type of respirators, we are using with success a respirator, which I designed. These respirators are made of five thicknesses of gauze and clean ones are given to the men each day.

Third. But a slight amount of the lead dust which enters the mouth and nose passes into the lungs. Fully three-fourths of it lodges in the mouth and nose, where it becomes mixed with saliva and mucus, and is unconsciously swallowed. In order to obviate this as much as possible, it is our practice to require our employees, before taking their dinner, and when cleaning up after the day's work, to thoroughly wash out the nares with warm water, and to gargle the throat and wash the mouth thoroughly with a 0.2 per cent solution of sulphite of soda.

Fourth. Each factory should have a room, preferably in a separate building, where the employees must eat, and no food should be allowed to be carried into any other room in the factory. Care should also be taken to see that the employees properly wash before eating their dinner.

Fifth. Milk being a valuable preventative, it is provided at the company's expense, and the employees are urged to drink it freely.

Sixth. All employees are provided with clean overalls each week at the company's expense.

Seventh. Ample facilities for bathing, with soap and towels, are provided, and it is our practice to pay the men for the time which they spend in taking these baths.

Eighth. The carrying and the chewing of tobacco at work is prohibited.

Ninth. Too much stress can not be laid upon the importance of the employment of a competent physician who will make a physical examination of all applicants for employment and reexamine the employees at a weekly interval. We do not employ any men under the age of 21 years, nor those who present the physical evidences or history of alcoholism, kidney disease, syphilis, rheumatism, or any chronic digestive disturbance.

Tenth. Each employee receives a thorough physical examination each week, so as to determine those who present the evidences of being in a condition of "lead store." The recognition of this in its incipiency and the administration of the proper treatment insures the relief of the condition before it has time to progress.

Eleventh. All employees are given free medical treatment and they are encouraged to consult me for any ailment, no matter how trivial. This further insures the early recognition of any cases of poisoning.

Twelfth. In each room in the factory is a notice which tells the employees of the precautions which they should take in assisting the company in preventing lead poisoning among them.

DISCUSSION.

Edgar T. Davies, Chicago, Ill.: Doubtless one of the most far-reaching and beneficial results of this present congress will be a definite improvement in the methods of gathering and compiling statistical data concerning occupational diseases. It is extremely difficult, at present, to know the exact status of this comparatively recent phase of investigation into conditions environing our industrial classes. For instance, many reputed cases of lead poisoning are, upon further diagnosis, declared not to be lead poisoning at all.

Again, I should like to lay emphasis upon statements already made that the greatest factors in eliminating these occupational diseases are not solely mechanical installations, safeguards, and so forth, but also recognized and observed shop discipline and faithful compliance with the rules of hygiene on the part of the employees.

OCCUPATIONAL DISEASES IN NEW YORK.

W. Gilman Thompson, M. D., New York.

Introductory.—The city of greater New York, with its population of over 4,000,000 and numerous and varied manufacturing industries, presents fertile field for the study of industrial diseases. Only within very few years, however, has the subject received any systematic study, but at the present time active research is being prosecuted in a number of directions, so that before long the subject is certain to receive the consideration which its importance demands.

In this brief review it is impossible to cover the entire field of the occupational diseases represented in New York, and I shall select, therefore, a few of the typical industries which furnish the greater number of incapacitating disease hazards, omitting reference to the special diseases of the skin, the eye, and the nerves, which are of great interest, although less serious from the standpoint of mortality or permanent invalidism.

Lead poisoning.—The numerous trades of which lead poisoning constitutes the chief hazard—amounting to about 150—comprise a very large proportion of the sources of industrial disease in New York, as everywhere else. This is due not only to the relatively large number of workmen employed but to the virulence of the poison and the common susceptibility of almost everyone exposed to it. In the United States few women are employed in lead industries as compared with the number in some foreign countries, particularly France and England, where pottery works and other trades using lead preparations admit female workers in considerably greater number.

Sixty fatal cases of lead poisoning occurring in New York State, of which 31, or more than half, were in the city of greater New York, were recorded in the two years 1909–10. These cases have been made the subject of exhaustive report by Dr. John B. Andrews.[1] It is perhaps unfair to assume that all of these cases were due directly to lead poisoning, as some of the patients had uremia, myocarditis, and other conditions, and doubtless some were victims of syphilis, alcoholism, and other causes of disease; nevertheless, in all the plumbism was a very marked feature and hastened death.

Among the occupations recorded in this series, that of painters (house and wagon painters chiefly) predominates, as it does in most large groups of lead cases, three-fourths of the series being classed under this heading. Among the other patients of this series, 3 were employed in white-lead manufacture, 3 in smelting and refining, 2 in storage-battery manufacture, 4 in the printing trade, 1 was a tinsmith using solder, and 1 a maker of wooden toys. One victim was a woman who painted white enamel on brushes.

I have collected data of over 300 cases of lead poisoning serious enough to demand hospital or dispensary treatment, occurring in my personal service and that of my colleagues in the wards of the Presbyterian and Bellevue Hospitals, and in my dispensary clinics. About 75 per cent of these patients were painters. It is well known that the risk from inhaling the paint dust is very great in those who paint wagons, carriages, and automobiles, where the work is done indoors, and successive layers of paint are rubbed down with pumice, emery, or sandpaper to give a smooth finish. Three men who came to my clinic were victims of lead poisoning acquired from scraping with automatic air chisels the red-lead paint from the double-bottomed warships undergoing repair in the Brooklyn Navy Yard. Dr. Kenney, one of my clinical assistants, and Dr. E. E. Pratt, of the New York State Factory Investigating Commission, found about 20 cases of serious plumbism there. The men were not in the Navy, but were hired on contract, and no measures had been taken to protect them from the hazard.

Dr. J. S. Kenney, who has been keeping special records for me of all classes of plumbism in the Clinic, reports, among others, the following employments in which the patients became so severely poisoned as to require dispensary or hospital treatment: Plumbers, sheet-metal workers, carriers of lead bars, steel hardeners (using molten lead), workers in brass and a "composition metal" containing lead, white-paint enamelers, typesetters, electrotypers, paint-factory hands, and painters. Workers in all these trades were treated during six months of 1911–12. There were in all 25 cases; and as this is only one of some fifty-odd dispensaries in greater New York where such patients may apply for treatment, some idea of the prevalence of lead poisoning in that city may be formed, although accurate records do not appear to have been kept elsewhere.

Brass poisoning, with "brass chills," as the workmen term their chief ailment, is common in New York. It happens that a large brass foundry is next door to my dispensary clinic, and both there and in Bellevue Hospital I have seen a number of cases. These workmen also acquire lead poisoning when the percentage of lead in the poorer quality of brass is high and suffer from arteriosclerosis and other manifestations of toxemia. One patient, who had had brass ague several times, presented also a lead line on the gums, arteriosclerosis, blood pressure of 156 millimeters, and a secondary anemia of hb. 35 per cent and red cells 2,160,000. He had been employed for eight years and handled bars of brass and copper.

Brass buffers and polishers inhale emery dust with the metallic dust. One such patient in my clinic, a young man of 23 years, had worked at this trade for several years, and had chronic bronchitis with emphysema. Another had attacks of numbness and coldness of

the hands, with cramps in the legs (intermittent claudication). Endarteritis obliterans was also present. Drs. Schwartz and Sicard have reported other brass-poisoning cases from my Clinic in the medical reports of the Cornell University Medical College.

Mercury poisoning has been made the subject of an admirable study by Mrs. Lindon W. Bates, in a monograph issued in 1912 by the Woman's Welfare Department of the National Civic Federation (New York and New Jersey section). This report comprises an analysis of 102 cases occurring in New York State and vicinity, principally in the felt-hat industry in Brooklyn, Yonkers, Newark, and Orange. Only one authenticated case was immediately fatal, but in many the degree of permanent invalidism was so great as to render early death almost inevitable. Many of the cases were observed among females, a few of whom were young girls.

The large majority of cases investigated were among felt-hat makers, who use both corrosive sublimate and a solution of nitrate of mercury in the process. The industry is much subdivided, and the workers classed as "makers" are the chief sufferers, but those known as fur cutters, brushers, sizers, pouncers, hardeners, and finishers are also afflicted.

Although, as stated, the report deals chiefly with felt-hat makers, other industries are included. Three cases of mercurialism were found among makers of incandescent lights using mercurial exhaust pumps. Two cases were among chemists manufacturing mercury compounds, and two victims were makers of cosmetics.

The substitution of silver for mercury in the manufacture of mirrors has materially reduced the number of cases of mercurialism from this source. The writer can recall visiting, as a boy, a large mirror factory where the workmen poured mercury from large bowls over the plate glass, and cases of mercurialism were not rare among them, but fortunately this process has been superseded.

Phosphorus poisoning is rare in New York City, being scarcely known outside the match-manufacturing industry. Of such establishments, there are at present only 16 in the United States, and only two of these are in New York State. The intensive study of these factories, made by Dr. John B. Andrews for the United States Bureau of Labor and the American Association for Labor Legislation, and published by the National Bureau of Labor in its Bulletin No. 86, January, 1910, has finally led, in 1912, to Congressional legislation which will doubtless amost entirely eliminate phosphorus poisoning from the list of occupational diseases, so that the matter will become chiefly of historic interest. Matches made with the exceedingly poisonous white or yellow phosphorus, in order to enable them to be ignited by friction on any rough surface, are now so highly taxed as to render their manufacture economically

impossible. For them will therefore be substituted the safety match, igniting only on the prepared surface of the match box, and made with the harmless red amorphous variety of phosphorus, the sesquisulphide. In the single match factory of Greater New York unhygienic conditions were found by Dr. Andrews, and no precautionary directions were furnished the workmen, but as the new law will eliminate the dangerous form of phosphorus the matter will not be further discussed here. This most creditable research of Dr. Andrews affords an admirable illustration of the value of intensive investigation of occupational disease, and the legislation secured mainly by his persistent efforts affords much hope for betterment in other hazardous trades.

Arsenic poisoning is much less common in New York since the recent substitution of anilines and other pigments for the coloring of wall papers and artificial flowers. Cases of chronic eczema, from handling various arsenical compounds, are observed in the skin clinics, however, and the few cases of chronic arsenical poisoning which enter the hospital are usually subjects of multiple neuritis. Such a case was recently seen in my clinic in Bellevue Hospital. The man was employed as a finisher of leather, which he scraped, rubbed, and polished. In part of the tanning process the leather was treated with arsenic, and as his work, at which he had been employed for 25 years, was very dusty, he inhaled sufficient arsenic to give rise to a painful multiple neuritis of both arms and legs. He was not an alcoholic subject, and had no nephritis, but a moderate arteriosclerosis. I have met with a number of similar cases of multiple arsenical neuritis acquired in different occupations. One of my patients, who had been employed for six years mixing Paris-green paint, had marked general bronzing of the skin.

Chrome poisoning or poisoning by chromic acid and chrome pigments is observed in the chemical works where these substances are prepared. Dr. C. N. B. Camac, formerly of my dispensary staff, published an article on this subject in the Medical Reports of the Cornell University Medical College. One of the cases presented the typical ulceration of the anterior part of the nasal septum, with a large perforation.

Poisoning by the fumes of mineral and other acids used in cleaning and other processes may produce serious effects, such as bronchitis, extreme anemia, digestive disorders, etc. A patient in Bellevue Hospital had been employed for four years in a large milk laboratory where he used acids in making butter-fat tests and in cleaning copper vessels. He suffered from dyspnea, weakness, a decided nephritis, and an anemia which showed 40 per cent of hemoglobin and 3,800,000 red blood corpuscles. Another of my patients, a lad of 14 years, had been employed for two months cleaning glass

with acid in an art-glass factory. He complained of nausea, vomiting, diarrhea, and vertigo. He had before been in good health, and always felt better on Sundays, when he did not work. He stated that many of his coworkers had similar symptoms, but he did not know the nature of the acid given him to use.

Wood alcohol, or methyl alcohol, is a cheap solvent for shellac and similar substances. Being extremely volatile, it becomes exceedingly dangerous when applied in thin layers over large surfaces and in a confined space. It is strongly and rapidly hemolytic, and is a virulent depressant and cardiac poison, producing death in coma in a very short time when inhaled in concentrated form. In victims who recover from inhalation of its fumes permanent blindness from optic neuritis and other eye lesions may result. From a brewery in Buffalo one case of death and one of permanent blindness were recently reported to the New York State Labor Bureau and in a brewery in New York City there have been three deaths from this cause within the past few years. So little is known by many physicians of this virulent poison that one of the deaths was reported to the health department as due to epilepsy! The shellac is used in the interior of large beer vats having a small vent at the bottom and a small manhole at the top, with no other opening.

Men go inside, work for 20 minutes, and then come out to breathe before reentering. To hasten their work they use broad whitewash brushes, which, of course, spread the shellac quickly over large surfaces. No attempt is made to force fresh air into the vats. This is one of the industries which, owing to exceptional hazard, should be controlled by legislation, and for use in such confined atmosphere the substitution of grain alcohol as a solvent should be required.

Silica.—An occupational hazard, due to dust of unusual origin, came recently to my notice. A friend who was being shown through a large soap manufactory in New York began to cough and sneeze violently. He also noticed that the girls employed all had their hair done up in paper bags. On inquiry it was found that to make a scouring soap a fine earth containing microscopic spicula from fossil animalculæ was added. In time the employees become used to the bronchial irritation, but the scalp, unless protected, presents intolerable itching and may become ulcerated.

Street cleaners and ash men.—It might be supposed that this class of workmen would be especially liable to dust inhalation with resulting chronic bronchitis, pneumonokoniosis, or tuberculosis. Such, however, is not the case, and probably the open air of such labor proportionately raises the coefficient of immunity. Drs. John Rogers and Bleiman a few years ago made a thorough examination of the entire street-cleaning force of New York City, with the result that they found no more tuberculosis or chronic bronchitis among the

workers than would be present in any large group of laborers. An examination made again in 1911 showed only 67 cases of tuberculosis among the 7,220 employees of the department in Manhattan, or 0.9 per cent. Moreover, it is probable that many of the tuberculous men had the disease in latent form when they entered the force.

Wood sawyers and pattern makers are employed in great numbers in New York. Most of the large planing mills are now well ventilated with fans and in these classes of workmen there is no marked frequency of occupational disease. A friend who employs many workmen in sawing rare woods for veneering, and also much boxwood, asserted that the only hazard he ever knew among them was the following amusing incident: A new East Indian wood, on being sawed into thin slabs, filled the workroom with fine red dust. At the luncheon hour one of the workmen dipped his head into a bucket of water to wash out the dust, when his hair promptly turned a bright green color, due to some unknown dyestuff in the wood.

The sandblasting of wood as a finishing process is a hazardous but not very common trade.

Furriers, hair pickers, and upholsterers are employed in large numbers in New York City, but anthrax is almost unknown among them. Since the passage of the law, in September, 1911, requiring the notification to the New York State Labor Bureau of cases of this disease only two or three have been reported from various parts of the State.

The menace from dust in these occupations, however, is very great, and the employees usually suffer in time from chronic bronchitis with fetid expectoration. One of my patients, who began as an upholsterer's assistant at 13 years of age and later worked as a hair picker, had a chronic cough for 20 years and finally developed tuberculosis. Another, for 10 years a cutter and cleaner of furs, presented a bronchiectatic cavity. At a fur-manufacturing establishment in the interior of the state pulmonary abscess is very common among the employees. The hair dust inhaled carries a variety of germs with it into the lungs.

Compressed-air illness.—Ever since the first comprehensive study of this topic in this country was made by my colleague in the Presbyterian Hospital, the late Dr. Andrew H. Smith, physician to the caisson workers of the Brooklyn Bridge in 1872–73, caisson and under-river tunnel boring has been increasing. With five completed double tunnels under the East and North Rivers and a great number of "skyscrapers" with very deep foundations, the field for study of compressed-air illness has been unsurpassed anywhere else in the world. In addition many bridges over the Harlem River have required caisson construction, as does the new aqueduct which passes

under both the Hudson and Harlem Rivers. The most extensive personal experience with the compressed-air illness of tunnel workers, as yet reported, was described by my clinical assistant, Dr. Frederick L. Keays, for the Medical Report of the Cornell University Medical College in 1909. As physician to the Pennsylvania Railroad he studied 3,692 casses of compressed-air illness with 20 deaths among the 10,000 workmen employed in the construction of four of the great river tubes built by this railroad, practically all of which cases were due to too-hurried exit from atmospheres of from 30 to 40 pounds of air pressure above the normal. As the tunnels are very long, an interesting opportunity was afforded of studying the men under varying conditions of ventilation, while walking in the tubes, as well as while working. In most cases, owing to the distances to be traversed, decompression was made continuous, excepting with two interruptions of about 10 minutes each, the total time for decompression from 40 pounds being 48 minutes, instead of by Haldane's method of sudden partial decompression to 12½ pounds, followed by very slow decompression, which would have required 90½ minutes.

Garment makers.—One of the largest industries of New York City is that of garment workers—i. e., wholesale tailoring, cloak making, shirt-waist making, and so forth. A large proportion of these employees are Hebrews who are prone to neuroses of various kinds, and in these employments many acquire tuberculosis as well. They have long hours of work, often in dusty, ill-ventilated, overcrowded rooms. They frequently use gas stoves or charcoal ovens for heating flatirons, and often work under the pressure of "speeding up," to finish tasks under contract, and to comport with changes in the seasons. They also often work in strained positions over machines which require operation by hand or foot. Investigations conducted by Dr. Graham Rogers, of the New York State Labor Bureau, have shown that the dust accumulation from cotton and wool fibers in these industries is as high as that in the pearl-button industry.

If a patient enters my Clinic with a cough and says he is a "presser" or "machine operator," he is almost certain to have pulmonary tuberculosis with chronic bronchitis. The leaky gas stoves and gas flat-irons contribute chronic illuminating gas poisoning, with symptoms of marked anemia, headache, and digestive disorders. In the New York City Health Department tuberculosis clinic, nearly 2 per cent of all the patients are garment workers.

[1] Bull. 95, United States Bureau of Labor, 1912.

LEGAL PROTECTION FOR WORKERS IN DANGEROUS TRADES IN THE UNITED STATES.

JOHN B. ANDREWS, Secretary American Association for Labor Legislation, New York City.

The need of legal regulations for the protection of workers in dangerous trades requires argument no longer. The need is apparent to anyone familiar with the facts.

It is admitted that the worker is entitled to a reasonably safe place in which to labor. This was acknowledged long before any considerable number of people agreed that legal regulation of working hours and wages was justifiable. Moreover, the reasonableness of sanitary regulations as a legitimate interference with work conditions prescribed by the employer and suffered by the employee has been more uniformly upheld by the courts than any other kind of labor legislation.

And, although it is also understood that in every industry there are employers who furnish model establishments, it is nevertheless perfectly clear to anyone who knows the facts that these more progressive and humane employers, as well as the employees of their less scrupulous competitors, need the protection of compulsory uniform standards of safety which can be secured only through legal enactment.

Most of our labor laws in America are for the promotion of the health and safety of the workers. Laws limiting the working hours of women, for example, have notoriously found their chief defense in the arguments of the medical profession. In the interest of health, too, a few American States have already prescribed a maximum 8-hour day for adult men in mines and smelters. The Federal Government has recently, by the extension of the 8-hour day to all subcontract work for the United States Navy, taken a step which is likely to have far-reaching results. These laws, as well as workmen's compensation or insurance for industrial accidents, are extremely important in their effect upon the safety and health of the workers.

But important as these more general regulations are they must be regarded in this discussion as subordinate to the special regulations for the prevention of accidents and diseases. These labor laws for the particular regulation of the hazard of employment in the United States may be briefly summarized as follows:

I. REPORTING OF INDUSTRIAL INJURIES.

(1) *Accidents.*—Forty-two States have now enacted laws providing for the reporting of industrial accidents either in factories, in mines, or on railroads.

(2) *Diseases.*—During 1911 and 1912, for the first time in America, eight States (California, Connecticut, Illinois, Maryland, Michigan, New Jersey, New York, and Wisconsin) enacted laws requiring physicians to report all cases of certain diseases of occupation, including anthrax, compressed air illness, and poisoning from lead, phosphorus, arsenic, and mercury, or their compounds.

II. PREVENTION OF INDUSTRIAL INJURIES.

(1) *Accidents.*—Forty-eight States have laws of various kinds designed to provide for the installation of safety devices and to protect workmen against industrial accidents.

(2) *Diseases.*—General legal regulations in the interest of comfort and health have been adopted as follows: Provisions for protection against (*a*) injurious dusts, in 22 States; (*b*) improper lighting, in 12 States; (*c*) poisonous gases, fumes, and vapors, in 15 States; (*d*) excessive temperature and humidity, in 11 States; (*e*) work in compressed air, in 1 State (New York).

By an act of Congress (Apr. 9, 1912) the manufacture of poisonous phosphorus matches is prohibited in the United States after July 1, 1913.

III. INSURANCE AGAINST INDUSTRIAL INJURIES.

(1) *Accidents.*—Fifteen States have workmen's compensation or accident insurance laws, all of which were enacted during the last two years.

(2) *Diseases.*—In the recent development of workmen's compensation and insurance legislation, no provision has yet been made in the United States for insurance against occupational diseases.

The industrial accident problem has been studied for years and it is more discussed now than any other question in the field of labor legislation. It is only within the last few years, however, that our industrial disease problem has received specific attention. Consideration of this latter question alone, therefore, will perhaps be more profitable and should serve to indicate how serious is the task of providing safeguards against the hazards of industrial employment.

In general, certain trades are unhealthful and require regulation, principally because the workrooms under ordinary conditions are likely to be poorly ventilated. More specifically the harmful conditions of employment are frequently due to the presence of dusts, gases, vapors, and fumes; to extremes of temperature, humidity or density of the atmosphere; and to improper lighting and overstrain.

The evil results of unhealthful conditions have long been recognized, and in every industry there are humane and intelligent em-

ployers who devote much time and money to the elimination of unnecessary hazards. Whether prompted by humanitarian or commercial considerations, these advanced employers frequently provide model establishments. By their commendable efforts they also help to establish reasonable standards of comfort and safety which, when drafted into labor law, constitute uniform minimum requirements for all employers in the same industry. But only through the uniformity of regulation which legal enactments alone can secure, can these more progressive and humane employers be themselves protected from less scrupulous competitors who would otherwise often fail to go to the expense of providing adequate safeguards, and only through such compulsory uniformity can the health of the employees of these competitors be protected.

It frequently happens, moreover, that even a vast majority of the manufacturers in a given industry claim that they are unable to bring about reforms, which they freely admit are desirable, without the aid of uniform legal regulations to force the recalcitrant minority into line. A striking example of this, the condition which culminated successfully in the poisonous phosphorous match prohibition act, is still fresh in the public mind. Match manufacturers, representing 95 per cent of the total product, testified before Congress that they could not substitute a harmless compound for the slightly cheaper poisons without a uniform law compelling all manufacturers in that industry simultaneously to abandon the poison. Match manufacturers representing the remaining 5 per cent of the product stood out stoutly until the last, declaring that they would close their factories before they would submit to this sanitary regulation already in compulsory operation in practically all the civilized countries of the world. It required labor legislation to prohibit the use of this unnecessary deadly poison before "phossy jaw," the most loathsome of all industrial diseases, could be abolished.

For other industrial poisons there are harmless but more expensive substitutes. Automatic mechanical processes can be substituted for dangerous methods still conducted by hand labor. Scores of operations in the present list of particularly insanitary trades can be made safe by the use of scientific apparatus for the removal of dangerous dusts and fumes.

The unhealthful trades demanding legal regulation may be conveniently classified according to the nature of the principal hazards:

(1) Trades menaced by specific industrial dusts, fumes, gases, vapors, and acids (poisonous and nonpoisonous).

(2) Trades menaced by compressed or rarified atmospheres.

(3) Trades menaced by improper light.

(4) Trades menaced by excessive temperature and humidity.

(5) Trades menaced by excessive strain.

Hundreds of peculiar injuries caused by these unhealthful conditions of employment are now beginning to receive serious attention in America as special diseases of occupation. This new line of study is most encouraging to those interested in securing effective legal regulation of unhealthful trades, because it has long been recognized by the people most familiar with the facts that specific studies, leading to the establishment of more definite standards of safety, are necessary before much even of the now existing legislation can be effectively enforced.

While such researches are under way we should emphasize at every opportunity the following considerations: (1) All preventable occupational diseases must be prevented; (2) those occupational diseases which we do not yet know how to prevent must be reduced to a minimum; and (3) the victims of occupational disease must be compensated for their injuries by some just system of insurance.

Efforts to carry out this program lead naturally to three principal methods:

(1) *Absolute prohibition.*—Through the successful outcome of the efforts to secure a prohibitory tax upon matches made with poisonous phosphorus, an avenue of tremendous possibilities, if carefully followed and not abused, is opened up for the further conservation of human life.

(2) *Regulation.*—There may be specific or general regulations:

(A) Specific regulation: For the sake of clearness we may recall, as an illustration of specific regulation, the earlier history of the match industry, when several countries, before harmless substitutes for poisonous phosphorus were discovered, attempted to prevent "phossy jaw" by requiring, (*a*) that match paste should contain not more than 7 per cent of the deadly poison; (*b*) that no one should be permitted to work in the poisoned atmosphere of a match factory more than eight hours in any one day; and (*c*) that children should not be so exposed. There were, then, in this intermediary period of specific regulation three definite limitations, (1) upon the hazardous material, (2) upon the period of exposure, and (3) upon the persons exposed. By this method of specific regulation also there are extensive possibilities for legal regulation in the interest of human health.

(B) General regulation: This method is, unfortunately, the most common. If, again, for the sake of clearness, we make final use of the match-factory illustration, we recall that before prohibition was thought of and before specific regulation had been tested, most countries had made vague efforts, through general regulations, to provide education, ventilation, and cleanliness for the promotion of the comfort and health of workers in match factories. This general method lends itself most readily to that large group of trades in which the occupational causes of industrial maladies are least clearly defined.

It marks the earliest stage of regulation where, on account of complex conditions of employment, we are still feeling our way in partial darkness without definite standards for our guidance.

(3) *Insurance.*—It is now recognized that the campaign for workmen's compensation or insurance for industrial accidents, both in Europe and in America, has been the greatest practical force in the prevention of such injuries. No intelligent person can go far in the study of insurance against industrial accidents without realizing that a logical consideration of the facts must lead likewise to insurance against industrial diseases. A workman, incapacitated by disease contracted in his trade and due to his employment, is as much entitled to compensation as if he had been disabled by an accident. In many European countries this principle is already established.

In all attempts to control dangerous trades the method of general regulation has naturally preceded specific regulation and absolute prohibition as well as insurance. On paper it is by far the easiest and unfortunately creates a temporary impression of accomplishment which is quite fascinating to the occasional-day reformer. It is probably a necessary first step in most industries where definite, enforceable, scientific standards must wait upon investigation and practical experiment.

In attempting to deal intelligently with these problems, our bill drafters are hopelessly baffled by the lack of scientific standards. And nothing is more clear to serious students of the subject than the unavoidable conclusion that effective laws for the regulation of unhealthful trades can not be properly drafted by busy and harassed legislators in the midst of legislative sessions. In the field of industrial hygiene no greater contribution could be made at the present time than the establishment by a commission of experts of such standards.

The existing laws in this country for the regulation of factory labor in the interest of the comfort and health of the workers are for the most part formulated on general lines—confused, indefinite, and full of loopholes. In the 15 States which even pretend to protect workers from the effects of poisonous gases, fumes, and vapors the laws seldom give more definite directions than that such dangerous gases, fumes, and vapors must be removed or rendered harmless "when injurious to the health of employees," or "so far as practicable," or "if necessary." In one State the law sweepingly provides for all health protection by stating that the factory inspector "shall also examine into the sanitary conditions of factories, workshops, mines, and quarries, and when any condition or thing is found that, in his opinion, endangers the health or lives of the employees, he shall notify and direct the employer to rectify the same." This class

of statute law, which is quite common, places no duty upon the employer to provide proper protection until he is ordered to do so by the inspector. When one considers the area to be covered in our large industrial States and the number of work places to be inspected, it can easily be seen that workers depending for their safety upon the specific orders of a limited number of inspectors are likely to receive entirely insufficient protection from laws of this character.

Although work in compressed air has become an important element in the building trades of this country, New York is still the only State which has a scientific law relating to work of this character.

There are only 12 States that make any mention of the subject of light in their general factory or labor laws. And "in not one of these," says a well-known efficiency engineer, "are the provisions sufficiently specific to render them of practical value."

Laws intended to protect the workers from injurious dusts in factories have been enacted in 20 States, but they are generally very crude and, in practice, more or less ineffective. "Drastic legal requirements alone," says the leading American authority on this subject, "are certain to bring about the required degree of comfort and health."

One reason that many safe methods are not in operation at the present time is simply that many employers, busy with the making of profits, have had no sufficient incentive to turn their attention to factory sanitation; and another reason is that State factory inspectors have not always been fully aware of their opportunities and responsibilities. The motive which leads some intelligent employers properly to equip their plants with safeguards is undoubtedly the conviction that it increases the efficiency of their workmen. There is abundant testimony to that effect from the rapidly rising profession of efficiency engineers and from their patrons. But even the most enthusiastic "boosters for safety" among the thoughtful efficiency experts recognize the absolute necessity for the establishment of uniform legal standards of safety, if the health of the great majority of factory workers is to be conserved.

Recently a few of the less thoughtful enthusiasts in the popular agitation for efficiency have failed to get the true perspective and have clamored for protection for the workers solely upon the ground that "it pays" the employer. Let us congratulate ourselves that those who are in danger of losing their health and their lives in their daily toil have in some instances at least that incidental advantage. But let us have less of this everlasting dinning in our ears, that before we ask for decent protection for the workers we must first demonstrate that each advance toward health and safety will actually put additional dollars in the pockets of employers. Let no one forget, meanwhile, that the philosophy of mercenary profit, when carried

to its logical conclusion, in some instances may result in less than decent protection when it is not clear that profits will respond immediately to the expense of safety. No man in this Republic shall be permitted for a moment to forget that, no matter how urgent is the duty to protect the property of citizens, society has a much higher responsibility, the protection of human life.

In our efforts to secure the necessary information upon which to base intelligent legislation we must draw more and more upon the expert service of the physician. Eight States have already enacted laws requiring medical reports on the most easily recognizable diseases of occupation. These reports will indicate special danger points for intensive duty within industrial establishments. All cases of occupational disease should be reported. They should be reported much more carefully and completely than accidents are now reported. And these records should not be regarded as mere statistical information for annual reports. They should be followed up in the industrial establishments by a State factory inspector properly qualified to do that kind of work. This will emphasize the growing need for medical inspection of factories. Periodical physical examination of workers in particularly hazardous trades is now required in one State, and the regular medical inspection of factories, now unhappily limited to three States, will undoubtedly be rapidly extended within the near future. This will lead likewise to the consideration of the industrial origin of many diseases and will elicit the interest of medical men who can, if they will, be of great social service in helping to solve the occupational-disease problem in the only proper way—that is, by prevention. One of the most valuable aids in this work should be the establishment of one or more medical clinics for the study of such maladies. Perhaps America could not do better than to follow the model of the first institution of this kind, at Milan, Italy. At our international congress in Switzerland, September, 1912, for three days leading authorities sat around tables and discussed this occupational-disease question. One of the most inspiring things at that meeting was the presence of medical men and factory inspectors from the "labor clinic" at Milan. They were there with a wealth of scientific data based on careful experiments and investigation. They had the advantage of more than two years' special experience in an institution provided with laboratories, clinics, and hospital wards, and dedicated to the solution of this perplexing and complicated problem. There can be no good reason why a similar institution should not be established in America. We need experts as badly as any other country.

In one respect at least we have already taken the experience of the most progressive European countries and have even improved upon it. It is pleasing to note also that this progressive step is in

the field of law enforcement. The administration of the labor law has been one of our greatest problems. The Wisconsin Industrial Commission, organized last year, is clothed with extraordinary powers, including the issuing of special orders having the force of law. Its work is being watched with the greatest interest, and its success will offer new encouragement to workers in this field.

We have made a beginning, then, in developing legal regulations for the prevention of industrial diseases. The filling in of the bare outline already provided will require years of effort, while the ultimate insurance of workers against sickness due to industrial employments is a big problem still scarcely discussed among us. Medical colleges might well include regular courses on industrial hygiene; hospitals, too, will be expected to improve their system of records; and, in the leading industrial centers, we shall eventually have special clinics and wards for the study and prevention of industrial diseases. Recent developments indicate that the medical profession will not evade its opportunity and responsibility.

For many years it has been our shame that in this field we have lagged far behind some of the countries of Europe. Our scandalous disregard for the safety and health of workers is widely known. But, in this country, true reform waits not so much upon sentiment as upon facts. We are just beginning to utilize the materials at hand, and our machinery for scientific cooperation in promoting industrial hygiene is but fairly set in motion. We move rapidly when once under way. Let us press on, in the hope that another generation may see America leading the nations of the world.

THURSDAY MORNING, SEPTEMBER 26, 1912.

OCCUPATIONAL DISEASES AND THE PHYSICAL EXAMINATION OF WORKERS.

Dr. GEORGE M. PRICE, Director of Investigation, New York State Factory Investigating Commission, New York City.

Occupational diseases may be broadly divided into two classes. In the first division belong all those diseases in which the etiological relation of the occupation is direct, easily traceable, and fairly constant. All the industrial intoxications and the various pneumonokonioses may be included in this class; likewise those injuries and accidents due to gases and fumes and those diseases caused by the infectious bacteria of materials. In the second class of occupational diseases belong those diseases which have but an indirect relation to the occupation. These diseases are more difficult to trace than those of the first class, being less persistent and certain. In this group may be included the many ills which workers are heir to—ills which owe their origin to occupation or some elements of occupation, but so indirectly that their incidence to the occupation appears altogether remote. By far the majority of all of the occupational diseases belong to the second class.

The study of the etiological relations of the diseases in the first group is comparatively simple. The morbific elements of certain occupations are fairly well known and determined and may be in most cases experimentally produced. Hence the study of infections and industrial poisons has rapidly progressed within the last decade.

The study of the etiology of the diseases in the second group, however, is very difficult, because the effect of the industry upon the health of the worker in these occupations is hard to trace. In the study of these diseases it is not sufficient to know the various elements and conditions of the occupation, but it is also necessary to reckon with comparative mortality and morbidity rates of workers in the different occupations.

Mortality statistics are unfortunately not very satisfactory or conclusive. Some of the reasons for this are (1) the comparatively small registration areas; (2) the lack of uniformity in the form of the certificates; (3) the absence of data as to duration of employment; (4) the inaccurate statement of occupations; and (5) the defective nomenclature of occupations.

The best standard of the healthfulness or dangers of an industry would be a direct study of the physical condition of its employees, and especially of those who have worked in it sufficiently long to be affected by it.

There are but two sources for such morbidity statistics—the records of sick-benefit associations and direct medical examinations of large numbers of employees in various trades.

Unfortunately, the records of European sick-benefit societies are not of very much value in the study of American conditions, and here in the United States data gathered in like manner are conspicuously absent. Nor is a study of occupational diseases possible from data obtained by medical examinations of workers, as such examinations have been almost entirely neglected.

So far as I know, Dr. James Alexander Miller's examination of 200 printers, as reported by him in the International Congress on Tuberculosis in 1908, was the first and only examinations of workers made in this country before my own recent examinations.

In my capacity as director of investigation for the New York State Factory Investigating Commission, I conducted, in the latter months of 1911, a medical examination of 800 bakers and 83 furriers. In the summer of this year another examination was made of 600 tobacco workers. In addition to these examinations, it was my privilege, as chairman of the executive committee of the joint board of sanitary control in the cloak and suit industry, to conduct a medical examination of 800 cloakmakers in the winter of 1912.

The examinations were made by competent physicians with hospital experience; the women tobacco workers were examined by Dr. Fannie Dembo, a very competent woman physician. The cloak shops and all the tobacco factories assigned separate places to the physicians for the examinations. The bakers were examined in the cellars where they worked. The furriers were examined at the headquarters of their union.

In most cases where tuberculosis of the lungs was diagnosed by one physician a confirmatory examination was made by a second physician. Sputum examinations were made in the first 120 cases, but proved negative and were of no value, as it was impossible to get sufficient sputum at the time. A urinalysis was made only in special cases. No blood examinations were made. Anemias were diagnosed by conjunctival and facial paleness.

Notes.—Of the 2,283 workers examined, 72.5 per cent of the tobacco workers, 98.2 per cent of the furriers, 98.8 per cent of the bakers, and 100 per cent of the tailors were foreign born.

All the bakers and furriers examined were males. All the tobacco workers and 30 per cent of the cloakmakers were females.

Most of the workers were between 16 and 44 years of age. The following percentage were above that age: 14.1 per cent of the bakers, 12.2 per cent of the cloakmakers, and 8.7 per cent of the tobacco workers.

A large number of those examined—i. e., 90.4 per cent of the bakers, 67.2 per cent of the cloakmakers, 52.8 per cent of the tobacco workers, and 48.2 per cent of the furriers—had been employed in their trade for 5 years or more.

Only a small percentage had worked at their trade for less than one year—none of the furriers, 1.2 per cent of the tailors, 3 per cent of the bakers, and 13.2 per cent of the tobacco workers.

The results of the physical examination of the bakers have been published in the preliminary report of the New York State Factory Investigating Commission for 1912; the detailed tables for the examination of the other workers will be published in the report of 1913.

PERCENTAGE OF MORBIDITY.

The general morbidity rate of the workers examined was as follows: Furriers, 89.2 per cent; tobacco workers, 71.3 per cent; tailors, 62.7 per cent; bakers, 57 per cent.

It will be seen that these morbidity rates do not differ very much from the 69 per cent morbidity rate of printers, as reported by Dr. J. A. Miller. It is also interesting to compare this morbidity rate with the rate in the Workingmen's Circle, which is an organization consisting of over 30,000 members, of the same class of workers as those examined by us. Their rates for the last five years are:

Year.	Number insured.	Cases of sickness.	
		Total.	Per 100 insured.
1907	10,757	1,287	12.0
1908	15,417	2,166	14.0
1909	26,582	3,665	13.8
1910	33,143	5,955	17.9
1911	32,449	6,237	19.2

Of course the fact has to be taken into consideration that the morbidity rates of the Workingmen's Circle, a society which gives sick benefits, must necessarily be less than the morbidity rate found in a general physical examination of workers in their shops who are able to pursue their work. In the following table I have given the general results of our examination without going into the details of age, duration of employment in the trade, nationality, and so forth. I have also included Dr. Miller's table of examination of printers.

	Bakers.		Tailors.		Tobacco workers.		Furriers.		Printers.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Number diseases	347	43.0	298	37.2	172	28.7	9	10.8	63	31.0
Number with one or more diseases	453	57.0	502	62.7	428	71.3	74	89.2	140	69.0
Total number examined	800	100.0	800	100.0	600	100.0	83	100.0	203	100.0
General:										
Phthisis	19	2.4	13	1.6	8	1.3	5	6.0	34	16.7
Rheumatism	47	5.9	45	5.6	30	5.0	6	7.2	.....	.....
Anaemia	183	22.9	173	21.7	74	12.3	.....	.....	2	1.0
Venereal	3	.4	2	.2	.....	.....	.....	.....	.....	.....
Total	252	31.6	233	29.1	112	18.6	11	13.2	36	17.7
Nerves and special senses:										
Ear	.....	.....	7	.9	7	1.2	.....	.....	.....	.....
Eye	92	11.5	51	6.4	72	12.0	8	9.6	6	2.9
Nose	6	.8	35	4.4	70	11.7	42	50.6	20	9.9
Nerves	6	.8	18	2.2	22	3.7	1	1.2	2	1.0
Total	104	13.1	111	13.9	171	28.6	51	61.4	28	13.8
Circulatory:										
Heart	54	6.8	36	4.5	25	4.2	5	6.0	6	2.9
Arteries	.....	.....	32	4.0	.....	.....	.....	.....	.....	.....
Varicose veins	41	5.1	1	.1	2	.3	.....	.....	.....	.....
Total	95	11.9	69	8.6	27	4.5	5	6.0	6	2.9
Respiratory:										
Bronchitis, acute	.....	.....	25	3.1	6	1.0	.....	.....	.....	.....
Bronchitis, chronic	177	22.1	56	7.0	15	2.5	25	30.1	11	5.4
Larynx	.....	.....	7	.9	12	2.0	.....	.....	1	.5
Pleurisy	2	.3	6	.7	1	.2	.....	.....	33	16.3
Asthma and emphyzema	21	2.6	16	2.0	.....	.....	11	13.3	8	3.9
Total	200	25.0	110	13.7	34	5.7	36	43.4	53	26.1
Pharynx	14	1.8	.....	.....	153	25.5	13	15.7	34	11.8
Tonsilitis	21	2.6	106	13.2	4	.7	3	3.6	.....	.....
Total	35	4.4	106	13.2	157	26.2	16	19.3	34	11.8
Digestive:										
Digestive organs	15	1.9	45	5.7	104	17.3	3	3.6	2	1.0
Hernia	26	3.2	17	2.1	.....	.....	.....	.....	4	2.0
Total	41	5.1	62	7.8	104	17.3	3	3.6	6	3.0
Genito-urinary:										
Nephritis	2	.3	3	.4	.....	.....	.....	.....	.....	.....
Pelvic	.....	.....	79	9.9	142	23.7	.....	.....	.....	.....
Total	2	.3	82	10.3	142	23.7	.....	.....	.....	.....
Skin:										
Contagious	.....	.....	1	.1	1	.1	2	2.4	.....	.....
Noncontagious	.....	.....	10	1.3	4	.7	19	22.9	4	2.0
Total	59	7.4	11	1.4	5	.8	21	25.3	4	2.0
Locomotion:										
Bones	.....	.....	1	.1	2	.3	.....	.....	.....	.....
Joints	[1] 54	6.8	28	3.5	50	8.4	.....	.....	1	.5
Total	.....	.....	29	3.6	52	8.7	.....	.....	1	.5
Total number of cases	842	.....	813	.....	804	.....	143	.....	168	.....

[1] Flat foot.

The salient points to be gathered from the table are as follows:

(1) The tuberculosis rate found among the various workers differs considerably. In our examination the highest rate, 6 per cent, is shown among the furriers, although the number of men examined

is rather too small to be conclusive. Among the three other classes of workers the bakers stand highest, with a percentage of 2.4; cloak-makers next, with a percentage of 1.6; and tobacco workers, with a percentage of 1.3.

It is of interest to compare these rates with the 17 per cent of tuberculosis found by Dr. Miller among the printers. On the other hand, the tuberculosis rate adduced in Table I is much higher than that prevailing in the Workingmen's Circle, where the rates for the last five years are as follows:

Year.	Number insured.	Tuberculosis.	
		Total.	Per 100 insured.
1907	10,757	26	0.24
1908	15,417	60	.39
1909	26,582	139	.52
1910	33,143	190	.57
1911	32,449	213	.66

(2) As to diseases of nerves and special senses, the furriers stand highest, with 50.6 per cent suffering from diseases of the nose. We also found a comparatively large number of eye diseases—12 per cent among tobacco workers, 11.5 per cent among bakers, 9.6 per cent among furriers, and 6.4 per cent among tailors.

(3) The rates of workers suffering from cardiac troubles do not differ very much. They are as follows: 6.8 per cent among bakers, 6 per cent among furriers, 4.5 per cent among cloak makers, 4.2 per cent among tobacco workers, and 3 per cent among printers. Of the bakers, 5.1 per cent suffer from varicose veins, whereas tailors and tobacco workers, whose work is sedentary, suffer comparatively little from varicosities.

(4) A very large number of furriers, 30.1 per cent, suffer from bronchitis, acute and chronic; 22.1 per cent of the bakers; 10.1 per cent of tailors; and 3.5 per cent of tobacco workers. These rates are considerably higher than the rate of 5.4 per cent of printers suffering from bronchitis, as quoted by Dr. Miller.

As is to be expected, a large number of tobacco workers, 25.5 per cent, suffer from diseases of the pharynx; also a large number, 15.7 per cent, of furriers.

The nature of this paper does not permit further deductions from these statistics, but I may add that I can not overemphasize the importance of medical examinations of industrial workers if comparative morbidity rates are to be established.

Our ideal should be a compulsory preliminary examination of all workers entering each trade, supplemented by periodical examina-

tion during their employment in the trade. Only by such authoritative examinations will it be possible to determine the effects of an industry upon the health of the workers in it and to determine effective measures for the prevention of occupational disease.

DISCUSSION.

Miss MARGARET MCMILLAN. The question was raised as to whether the beginning of the working life is not a late stage at which to make an examination for tuberculosis. It is easy and practicable, not only to make this examination, but to provide treatment at a comparatively low cost, by means of health centers (including open-air schools and night camps, without removing the children far from their homes) as a part of the work of school medical inspection. At the Deptford (London, England) health center children selected as anemic and on the verge of contracting disease, and also a few cases already attacked, were cleared up entirely after six months' sleep in the open. The cost of fitting up the night camp for 20 children was $100. The camp is close to the homes of the children and is visited daily by many of the parents. It is under the supervision of the school medical officers of the center.

Dr. ERNEST D. EASTON, Newark, N. J. What per cent of employees are suffering from anemic conditions, and therefore susceptible to tuberculosis and other diseases, as shown by hemoglobin or other tests?

Dr. G. M. PRICE. No hemoglobin tests were made. Conjunctival and facial evidence showed the following: Bakers, 183 (22.9 per cent); tailors, 173 (21.7 per cent); tobacco workers, 74 (12.3 per cent).

EXAMINATION OF EMPLOYEES FOR TUBERCULOSIS.

THEODORE B. SACHS, M. D., Chicago, Ill.

Systematic examination of employees for tuberculosis leads to the detection of the following classes of cases:

I. "*Open*" *tuberculosis* (tubercle bacilli in the sputum). Most of these cases are moderately or far advanced; a small proportion are just beyond the incipient stages.

II. *Active tuberculosis, still* "*closed*" (no tubercle bacilli in the sputum), a class of cases varying according to activity and extent of the process; chiefly incipient, some advanced. Unless given timely and efficient treatment, a large percentage of these cases pass into Class I (become "open," communicable).

III. *Inactive tuberculosis;* signs of a healed lesion; no symptoms of active disease. A previous history of active tuberculosis or a

tuberculous family history can be elicited in a large proportion of these cases.

IV. *Predisposition to tuberculosis* (by malnutrition, anemia, or any debilitating condition).

METHODS OF SOLUTION APPLICABLE TO EACH CLASS OF CASES.

It will be seen from the consideration of the above-stated classes of cases that the tuberculosis problem in a working place presents the following important phases for solution:

1. *Detection and segregation of "open" cases of tuberculosis.*—A large number of these cases in working places without medical supervision remain undetected for months or years, acting as prolific sources of infection. Their elimination from close association with other employees, as well as the immediate institution of hospital, sanatorium, or, if feasible, home treatment, is an imperative step in the interest of those afflicted as well as of the entire working force. Institutional treatment best safeguards the interests of all concerned.

Those with the tuberculous process arrested and working power restored by institutional or home treatment, but still showing tubercle bacilli in the sputum, may be given either suitable outdoor work or indoor work in hygienic, well-ventilated quarters, but not in close contact with other employees. Conscientious, painstaking use of all the necessary precautions on the part of the tuberculous employee is a factor to be considered in the solution of each individual case.

The number of "open" cases of tuberculosis discovered during the first few months of operation of an efficient system of medical examinations may be considerably larger than at any subsequent time, and yet the number of "open" cases is small as compared with the entire working force or the second, third, and fourth classes of cases above mentioned.

It is not the number of "open" cases but the possibility of transmission lurking in each case of this group through indiscriminate expectoration that renders control of "open" cases of tuberculosis most important from the standpoint of health of the entire working force. An efficient system of medical examinations in a working place should have, as one of its most important objects, the timely detection and control of these cases.

2. *Sanatorium or home treatment of "closed" active cases of tuberculosis.*—As previously stated, cases of "closed" active tuberculosis vary considerably, according to the degree of activity and the extent of the tuberculous process. The variation extends from the very slight impairment of general condition, with little constitutional disturbance and no positive physical signs of pulmonary involve-

ment, to progressive deterioration of health, with afternoon fever, various symptoms of toxemia, and marked physical signs of a progressive lesion.

Cases of the mildest type frequently respond favorably, without discontinuance of work, to a rearranged régime of life, embracing particularly longer hours of night rest, avoidance of overexertion, a more liberal diet, and abundance of fresh air. A limited period of sanatorium treatment may be advisable, however, from an educational standpoint, in a proportion of cases even of the mildest type.

As a general rule, temporary discontinuance of work and treatment in a sanatorium are indicated in the majority of active cases, and this should be continued in each individual case up to the point of arrest of the tuberculous process and restoration of the working capacity.

Early diagnosis of active cases of tuberculosis is most important from the standpoint of chances of recovery and duration, and consequently the expense of treatment.

The earlier the diagnosis the better are the chances of recovery and the shorter is the period of treatment.

3. *Increase of resistance of employees with signs of inactive tuberculosis and of those predisposed to the disease.*—Employees with signs of "closed" inactive tuberculosis (Class III), as well as those predisposed to the disease (Class IV, the anemic, poorly nourished, those with frail physique, and so on), may be classed under the general designation of "employees with low resistance." This group, forming a considerable proportion of any working force, offers a fruitful field for correction based on thorough investigation of each individual case.

Due consideration should be given in all such cases to the following factors influencing the health of the employees: first, the physical fitness of the employee for the given task (degree of exertion involved, position at work, hours, surroundings, et cetera); second, personal régime, i. e., sufficient rest, ventilation of bedroom, nourishing diet, avoidance of harmful conditions and practices, and so forth. With all these items in the personal life of the employee thoroughly analyzed by the examining physician, considerable improvement of the physical condition of an employee is often possible, even with a very slight rearrangement in his daily régime.

The task of the physician is that of a teacher of right living. Personal instruction given by him to the employee, followed by detailed home instruction by the nurse, should mark to the employee the stepping stone to better health.

4. *Instruction of the entire working force in the essentials of right living.*—Noonday or evening talks on "essentials of right living,"

"prevention of disease," and similar topics given from time to time to the entire working force, or to its separate groups, tend to the enlightenment of the worker in the essentials of health and its preservation. The interest in matters pertaining to health is rapidly increasing among working people, and a physician, speaking on this subject, to the point and in simple language, will find in them an appreciative audience.

The ultimate result of the operation of a system of medical examinations and instruction in a working place is a higher standard of health and efficiency of the working force, as well as a stronger bond of understanding between the employer and employees.

EXAMINATION OF EMPLOYEES FOR TUBERCULOSIS A PART OF GENERAL MEDICAL EXAMINATION; TIME OF THE FIRST AND SUBSEQUENT EXAMINATIONS.

Examination for tuberculosis should be a part of the general medical examination. An efficient general medical examiner of an industrial concern is fully conversant with the disease. It is desirable, however, that all medical examiners should acquaint themselves with methods of diagnosis and solution practiced in well-conducted tuberculosis clinics.

It is apparent that, in the interest of all concerned, the first examination should take place at the time of the engagement of the employee. This is being done at present, with some variations, in a few Chicago concerns. Preliminary information is obtained by means of an application blank, including questions pertaining to former and present health of the applicant, and his general appearance is scrutinized by the employment manager and the nurse assigned to his office. Suspicious cases are submitted to the physician for immediate examination. All other successful applicants are examined during the first week of their employment. Sears, Roebuck & Co. and the International Harvester Co. at present examine all their applicants for work.

In other concerns the medical examination of the employee comes with the application for membership in the Employees' Benefit Association, which includes a varying proportion of the working force. This is the case with Sears, Roebuck & Co., International Harvester Co., Montgomery Ward & Co., Commonwealth Edison Co., Chicago Telephone Co., Swift & Co., and others. Welfare departments operated by these firms also bring to the attention of the medical examiner a certain proportion of suspicious cases.

The general medical examination of an employee should be repeated at certain intervals, and also when an employee becomes sick while at work, when the appearance of the employee, or of certain symp-

toms, suggest the possibility of a gradually developing illness, or on return to work after a period of absence due to illness.

THE CAMPAIGN IN CHICAGO FOR EXAMINATION OF EMPLOYEES FOR TUBERCULOSIS.

Eighteen months ago I submitted to the Chicago Tuberculosis Institute a plan of examination of employees for tuberculosis. The plan is described in detail in this paper. To put the plan into operation, the institute appointed a committee on factories, the membership of which consists of myself, Dr. Henry B. Favill, and Sherman B. Kingsley, with James Minnick acting as secretary.

The important thing in Chicago, as it would be in any other city, was to interest the employer in the necessity of such examinations. The chief obstacle to the introduction of any system was the lack of information on the part of the employer that there is any such thing as a tuberculosis problem in his place, as well as the lack of appreciation on his part that any benefit can accrue to the firm through the operation of such a system.

In making the appeal to the employers we have placed emphasis on the financial loss sustained by the employer through the imperceptibly growing reduction of working power in the early stages of the disease, the danger to the entire working force from the unknown, uncontrolled "open" cases of tuberculosis, the constant infection of other workers, the subsequent loss of experienced men, and the reduction of the general efficiency of the entire working force through the existence of uncontrolled sources of infection. In our campaign we were materially assisted by the humanitarian attitude of the employers toward their workers.

Early in the campaign I devised a chart which proved of value in the conferences between the committee on factories of the Chicago Tuberculosis Institute and the employer whom we were eager to enlist. The chart, as here reproduced, shows in concentric circles the various groups of tuberculosis cases which you would expect to find in a working place, the size of the circle showing, in a general way, the relative number of workers included in each group, and the degree of shading pointing to the relative importance of the group from a sanitary standpoint:

It was very essential to make it clear to the employer that systematic examination of employees for tuberculosis will disclose not only the "open" and active cases of tuberculosis, the solution of the majority of which lies in institutional treatment, but also the larger group of workers in whom a predisposition exists, either because of latent infection or because of malnutrition, anemia, and so forth. One of the important objects of the examinations, the employer was told, is to raise the resistance of these groups through proper medical

advice, education in right living, change in occupation if necessary, and in other ways. By the spread of this education in right living among the employees the final result is a higher standard of health and efficiency of the entire working force.

As result of a campaign conducted by the committee on factories of the Chicago Tuberculosis Institute during the last 18 months, systematic examination of employees for tuberculosis is at present in operation in the shops of the International Harvester Co., Montgomery Ward & Co., Chicago Telephone Co., and Swift & Co. Sears, Roebuck & Co. have for some time past paid special attention to tuberculosis as a part of the general examination.

The physicians connected with the above and other concerns meet with the committee on factories of the institute from time to time to discuss the important phases of their work, and these meetings are very important in the gradual formulation of principles and practices. At the two conferences so far held some of the subjects chosen for discussion were: "The best method of campaigning for the extension of the examination of employees to other concerns," "The time of the first examination of the employee," and "When should the examination be repeated?"

THE DETAILS OF THE PLAN OF EXAMINATION OF EMPLOYEES FOR TUBERCULOSIS.

The details of the plan submitted to the Chicago Tuberculosis Institute 18 months ago, and since then advocated under the auspices of its committee on factories, is as follows:

1. *Physician to examine all suspicious cases.*—In places with established medical service this task may be assigned to the physician on the staff of the firm. In large establishments a special tuberculosis examining physician may be necessary. In either case possession of special experience in the diagnosis of tuberculosis is very important.

Duties of the physician are the examination and diagnosis of cases; disposition of those found tuberculous; instruction of the sick in the essentials of treatment and of the predisposed in right living and in measures tending to increase the general resistance; frequent noon or evening talks to the entire working force on maintenance of health and prevention of disease.

The hours of work of the physician are determined by the extent of the problem; one, two, or more afternoons a week, or a regular daily service. Compensation should be graduated according to the amount of work and the individual qualifications.

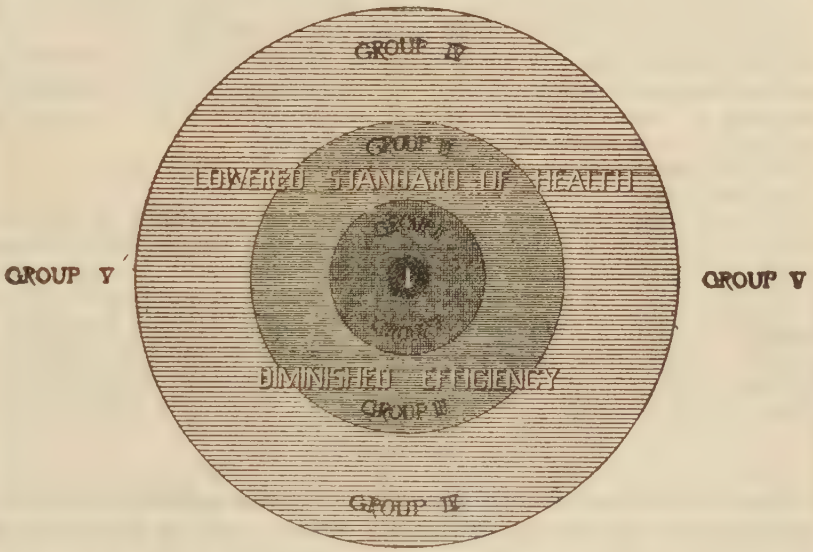
2. *Trained nurse to assist the physician.*—Duties are to assist the physician during clinic hours; to visit and study the homes and living conditions of employees pronounced tuberculous or predisposed; to instruct in the fundamentals of right living, and in the methods of care and prevention, by actual demonstration in the employee's home; to gather in each individual case information essential to its right solution.

Compensation is that of a visiting tuberculosis nurse, regulated by the responsibilities of the position and individual qualifications.

The TUBERCULOSIS PROBLEM IN A WORKING PLACE

by Theodore B. Sachs

GROUPS OF WORKERS



CONDITION		REMEDY
GROUP I *Tuberculous.*	*"Open" Communicable Cases.*	*Periodic Medical Examinations.*
GROUP II *Tuberculous.*	*Disease-Active, Progressive.*	*Right Conditions for Entire Working Force.*
GROUP III *Tuberculous.*	*Disease-Inactive.*	*Education of All in Right Living.*
GROUP IV	*Workers With Low Resistance.*	*Hospital & Sanatorium Treatment for Groups I, II & part of III.*
GROUP V	*Workers in Average Health*	

RESULT

HIGHER STANDARD of HEALTH AND EFFICIENCY

For Copies of This Poster Apply to the Committee on Factories of The Chicago Tuberculosis Institute

3. *Classes of cases to be examined.*—At a conference between the superintendent, the physician, and the nurse, it is agreed that the working force is to be watched for the following classes of cases:

(*a*) Employees in whom diagnosis of tuberculosis was previously made.

(*b*) Employees whose poor general condition (malnutrition, anemia, or weakness), in connection with other suspicious symptoms, suggests the possible presence of the disease.

(*c*) Employees with histories of protracted (or recurring) cough and expectoration.

(*d*) Employees in whose families or homes a case of tuberculosis exists, or in which a death from tuberculosis occurred, etc.

In large establishments a circular letter may be sent previous to the conference to all superintendents or foremen, calling attention to the above-mentioned classes of cases, and explaining the object and scope of the proposed examinations.

4. *Tuberculosis clinic.*—With the compilation of a list of suspicious cases a tuberculosis clinic is established on the premises of the firm, in which all such cases are subjected to a thorough medical examination.

Each individual case is classified, (*a*) according to diagnosis, tuberculous or nontuberculous, active or nonactive, open or closed; (*b*) according to necessity of change of occupation or discontinuance of work; (*c*) according to need of hospital, sanatorium, or home treatment.

The solution of each case is considered after a full analysis of all its medical and social aspects.

At times some difficulty may be encountered in persuading an individual member of the force to undergo the examination, but, as in all matters, diplomacy and kindness will overcome all obstacles.

Besides serving as a diagnostic station the clinic maintains continuous supervision over (*a*) employees classed as predisposed; (*b*) employees returned to work, with disease apparently cured or arrested by institutional or home treatment; (*c*) employees taking home treatment and assigned to the clinic by the employer.

CONCLUSION.

Very important considerations prompted the campaign in Chicago for the introduction of systematic examination of employees for tuberculosis. They were, first, the realization that early diagnosis of tuberculosis can be best attained with a system of examination of working people that will detect the disease long before the pronounced symptoms manifest themselves and which will detect it while its victims are at work and unconscious of its presence; second, the operation of a system of examination in a working place and the knowledge of the existing conditions gained thereby eventually leads to the improvement of sanitary conditions and enlists the support by the employer of adequate and efficient institutional provision for the treatment of tuberculosis (the employers' interest in the antituberculosis campaign is of vast importance); third, the further realization on the part of the workers, employers, and the community at large of the present utter helplessness of a worker in the case of illness will lead to more comprehensive measures for

the protection of the worker and his family in the case of his illness (further extension of the principle of the employees' benefit associations, workmen's insurance, and so forth).

Experience in antituberculosis work in a community teaches us that support of any element in the community can be permanently gained by a clear demonstration of the relation of that element to the existing problem, and this is becoming apparent in our present campaign in Chicago.

SUMMARY.

The aim of the described plan of examination of employees for tuberculosis is, first, detection and suppression of sources of infection in working places; second, detection of cases of the disease in the curable stages; third, guidance of all employees predisposed to the disease and of those who are reemployed after having recovered their health through sanatorium or home treatment; fourth, guidance of all employees in right living and in methods of prevention.

DISCUSSION.

Dr. Charles W. Crankshaw, physician in charge of the Prudential Infirmary of the Prudential Life Insurance Co., Newark, N. J.: Just a word in addition to the excellent papers of Drs. Price and Sachs. The physical examination of employees for all trades is not only highly commendable for the protection of fellow employees but is humanitarian. It has been my experience that in those cases where tuberculosis of the lungs has been detected you at once have an eager listener for instruction as to what to do, and one who is glad to follow your advice. In this you act as both physician and teacher, and are able to accomplish three things: First, you protect the person examined; second, the home from which he comes; and, third, the general welfare of humanity.

RESULTS OF A HYGIENIC AND SANITARY INQUIRY INTO THE ITALIAN PRINTING TRADE.

Prof. Dr. L. Carozzi, Milan, Italy.

In the course of an inquiry on the hygienic and sanitary conditions in the Italian printing trade, I have had occasion to study, during two years, about 600 printers (compositors and pressmen) and statistical tables, covering about 30 years, of many mutual societies of printers.

Modern printing establishments (with good light and ventilation) are very rare in Milan, and in the great majority of the smaller workrooms conditions are very unhygienic, so that there are factors which

would produce disposition to tuberculosis. My statistical data are quite conclusive of the unfavorable effects of this occupation on health, caused, in the majority, by the confinement in unhygienic workrooms.

My observations permit me to add the following: The children begin to work in the printing trade without an accurate medical examination and at the lowest legal working age. The per cent of stillborn children and of miscarriages from parents occupied in printing trades is very high—38.2 per cent.

The average morbidity rate for all diseases among compositors and pressmen is very much higher than the average for other classes generally. The morbidity rates for workmen are very high, especially in the first years of their occupation, and the sum of the days of incapacitation from sickness is very large. The morbidity is due to respiratory and gastric complaints. The per cent of muscular and joint diseases is relatively high.

If plumbism with its classic symptoms shows a very low per cent, we must not forget that other complaints may be due to lead poisoning which is not yet recognized as such in this class of working people (especially such complaints as gout, arthritis, arteriosclerosis, and muscular and joint affections). I can say that colic is the exception rather than the rule among printers.

Diseases of metabolism, if they are not characteristic of this class, deserve special attention for their frequency among printers in comparison with other classes generally. Among nervous complaints, neurasthenia is certainly the most widespread, owing to many factors.

Type metal is an alloy of lead, antimony, and small quantities of tin and copper. My experience does not confirm the possibility of an antimony poisoning among printers. The dust in printing shops and type foundries examined has been found to contain very much lead but never antimony.

Among linotypists and pressmen we may occasionally observe a peculiar symptomatology, confirmed by the examination of the blood, and caused by the continual use of benzol, benzine, mineral oil, and benzographol [pricking, tingling, numbness in the extremities; the number of blood corpuscles is greatly increased].

Eye diseases are very frequent, and are really due to the special occupation of compositors, from a transitory spasm of the accommodation to the most severe cases of myopia.

High blood pressure is not rare, but is due to other factors besides the lead.

Accidents are relatively rare, in the majority of cases not severe, and more frequently they involve the hands and feet.

Mortality statistics confirm what I have already said. Among the causes, tuberculosis, especially of the lungs, is the most frequent, and

next in order we find acute and chronic diseases of the respiratory system. The death rate from tuberculosis of the lungs is very high—33.1 per cent of the deaths from all causes and 66.1 per cent of the deaths due to respiratory diseases. Other important causes are the infections, typhoid fever, influenza, and so on. The highest death rate among printers is between the ages of 16 and 35. Consequently the average span of life for employees in the printing trade is very low.

HYGIENIC AND SANITARY INQUIRY IN SILK MILLS.

Prof. Dr. L. Carozzi, Milan, Italy.

In 1909 the factory department of inspection asked me to answer the following questions, among others: Are silk spinners really subject to organic diseases? To what other diseases are the silk spinners predisposed? What are the causes? What degree of temperature and humidity can be kept in a silk mill without being injurious to the workers?

From the examination of 300 spinners among the female employees in 25 silk mills, I have come, since 1909, to the conclusion that among the silk spinners examined no organic change occurs except in the blood. This statement concerns spinners employed under certain conditions of temperature and humidity in silk mills. I found, for instance, a remarkable increase in the number of blood corpuscles, when the relation between the wet and dry bulb thermometers in the workrooms was not that fixed by the English cotton-cloth factories act.

This hyperglobulia is perhaps simply due to an unequal distribution of the blood in the circulatory system.

I found also among these female employees a moderate chloranemia common to textile workers.

I have not sufficient data to decide as to retarded or disturbed development among the female children, but my inquiry into the history of the married women among the silk spinners examined shows a large infant-mortality rate. I think that the cause of this could also be found in other factors: Heredity, insanitary houses, insufficient food, and so forth.

It is certain that by bettering the living conditions, and especially the food, of the working class, we may better their health. It would be most inadvisable to lower the working age limit. On the contrary, it would be better to endeavor to raise it so as to prevent the employment of children until they attain the age of 18.

The conditions which I have been able to investigate in the field of industrial and social hygiene of this trade include: The construc-

tion of the mill, natural light and ventilation, flooring, the number and per cent of living and dead children, the employment of female children and married women, and the development of female employees.

THE AMERICAN MUSEUM OF SAFETY.

WILLIAM H. TOLMAN, Director, American Museum of Safety, New York City.

In America safety and caution are not popular. "Why should I be careful? I have never been hurt yet," says the man whose experience should make him respect the potential danger of machines and processes, yet he may be the very one to be the next victim of his own bravado and folly. He may be indifferent to his own safety, but he has no right, through this carelessness and indifference, to deprive the family of his support in case of his disablement, nor at the same time to imperil his fellow workmen who may be affected by the accident.

Another class is the green, unskilled worker who enters upon his industrial life without a knowledge of the perils and risks he is to encounter. Both these classes should be "shown;" they need to see the wheels and cogs actually revolve, so that the danger may be visualized; then the necessity for caution and safety is borne in upon them. But where to go for such a practical demonstration? The employer can not do it for the community; he may not do it for even his own people. It is again the case of what is everybody's business is nobody's business.

There are four groups of interests involved in accidents arising in industrial pursuits—the workman, the employer, the community, and the people at large. The latter are involved almost exclusively as sufferers in accidents occurring in different means of transportation and may be ignored in dealing with accidents in manufacturing operations.

The community is involved, because it is very often called upon to care for those whose means of livelihood have been impaired or entirely cut off, directly or indirectly. There are those who claim that this is imposing upon the community a burden which it is the duty of the industry to bear, and we are upon fairly debatable ground.

The workman is probably the greatest sufferer, considering his means, and this has led public opinion and, in more concrete form, legislative bodies to seek relief along the least line of resistance—that of making the employer, usually possessing financial responsibility, to carry the whole load.

To reach a thorough understanding and to get a fair and honest distribution of responsibility and of contributions for relief an analysis of industrial accidents will be helpful.

There is, first, the large group, under present circumstances in this country, which is due to the inherent risks of the industry, the accidents which no foresight or care on the part of the employer or the workmen would prevent. There is a fair and should be a direct charge upon the industry which the consumer ought to be made to share in if it were possible to add a part or the whole of it to the price of the product.

Then there are the accidents due to carelessness or recklessness of workmen and their fellows, many of which are brought about by the resistance to reasonable discipline, which is a characteristic of the American workman, and many of which are caused by ignorance, for which the management can fairly be held responsible.

For accidents brought about by carelessness or recklessness the guilty should suffer, and if there be an appeal to anyone it should be to the fellow workmen. That the latter do often nobly respond as individuals we all know from our own experience; but I do not know of any systematic effort in that direction, and certainly the labor unions have never clearly recognized their duty in this respect. In fact, where they do possess the power, their exercise of it tends to increase the fatalities through their frequent tendency to weaken discipline.

The last group of accidents is that for which the employer is squarely responsible because he does not provide the necessary safeguards or because he neglects opportunities fairly within his reach to educate the ignorant, to restrain the reckless, or to secure the active cooperation of the intelligent and the well disposed. It is not enough to spend money and exercise ingenuity in equipping a plant with safety devices and in seeing that they are kept in efficient condition. It is not enough to draw up sharp rules and to see that they are obeyed. There must be developed systematically throughout the organization a spirit of cooperation from top to bottom, and that spirit of cooperation must spread over the entire industry.

Fortunately in the iron and steel industry the splendid spirit of cooperation is a powerful aid in attaining the ends sought, and that industry stands foremost as the one branch of manufacturing in which this spirit prevails. But that cooperation must be universal. The companies and their managers and associates must have the active help of everyone down to the water boy. There must be a frank and free interchange of experience and attainment by all of what reasonable regulations are promulgated. At this point the American Museum of Safety offers a clearing house of simple, practical, and efficient methods.

It comes right down to a matter of business. The country has been aroused. It has been stirred by some men and women who possess that honest enthusiasm which is unhampered by facts or checked by the rights of others. It has been stirred, too, by self-seeking demagogues. But whether it be by honest lovers of humanity or wicked scoundrels the fact remains that known and serious abuses, long continued and callous indifference have created in the public mind that feeling of exasperation and antagonism which in a country like ours spells hasty and unfair legislation against the one who is known to have money and can be bled.

The most effective means for meeting such a movement, which may become dangerous through the activity of enthusiasts and of demagogues, is to remove what just complaints and criticisms there exist.

To head off oppression or unjust legislation it behooves our manufacturers to do all in their power to reduce to a minimum the suffering due to accidents to life and limb. Even the inherent risks of occupation constitute a serious charge upon employers and employees, and these in themselves can be made a serious burden.

Our industrialists must put their house in order: they must cut the ground from under a movement which is dangerous because there is some justification for it: they must come into the forum of public opinion with clean hands. After all, it is a business proposition, however much the sentimental and humanitarian side may at first appeal for attention and sympathy.

"John won't want me now," was the recent pathetic cry of a young woman in a factory as she fell to the floor, her right arm wrenched off at the shoulder by the unguarded machine at which she was working. It was on the eve of her marriage. "John can't afford to mary a woman who is no helpmate to him."

A few years ago we were considered visionary in our advocacy of safety devices, greater caution, and the sanctity of human life, but I am glad to say that at last we are awakening to the importance of this great subject of safety, a subject that has come to stay for all time and as a right. It is our duty to surround the toiler who makes the wealth of the Nation with every possible safeguard and to protect his life and health while he is at work.

I will go still further in a demand for greater safety for the public, the man in the street, the man on his travels, the man in his home. This does not alone apply to safety devices, but to sanitation, clean streets, less noise, pure foodstuffs, pure air, light, and water—the essentials of health.

The time has passed in which it is necessary to philosophize merely and to discuss only these vital problems in the United States. The thoughtful citizenship of the land is demanding constructive action. In its efforts to provide a practical system of compensation it came

up against a dead wall. It found that compensation was not the solution, but that prevention struck at the root of the evil.

Although the awakening has come, the field for activity is so great that it needs continuous application and a well-organized propaganda throughout the country. Do not make the mistake of thinking this can be done in a month or in a year; it should be a continuous influence; there should never be any let up. It is such a mighty subject that it must become part of our educational system. At present we are dependent on the teachings of other great nations; if, now, we are wise, we will let this be a guiding influence, and not think ourselves such a superior race, and so be deluded with a fatal optimism.

If now our country would escape the reproach and disgrace of being the only civilized Nation in the world to fail to provide instant and automatic relief for the sick and injured workmen, the whole Nation must stop and think; no one section, no one group, no combination of interests can remove the reproach; the awakening must be national. The selfishness of private greed and the personal interests of the politician are ever present in systematic insistence, and will become overwhelming unless the attention of the whole people is directed to our needless sacrifice of human life and efficiency.

Until such time as the consideration of safety becomes of as great importance as questions of producing, selling, advertising; until it becomes a part of a plant's industrial policy; until this point has been reached, the American industrialist will not have done all in his power to protect his industrial army, who are intrusting their lives and limbs to his keeping, at least during the working day.

To do all this, and more, too, the last decade has seen the establishment of museums of safety, where employers, workmen, and the public may go, see, and study, in actual operation, or by means of models, the simplest and best methods of protecting the dangerous parts of machines and processes, so as to safeguard the lives and limbs of the workman. The first in America has its present headquarters at 29 West Thirty-ninth Street, New York City.

A museum of safety utilizes the basic principle for preventing this waste of human life and limb, with its attendant train of sickness, misery, and poverty.

The life of the head of the family, the father, the sole breadwinner, is snuffed out by a preventable accident, leaving the wife and children stranded. The mother, in most cases an unskilled worker, must take a wage barely sufficient for her own needs; consequently charity must step in to support the children and educate them. No self-respecting workman wishes to be the recipient of charity. The stamina of children reared in charity is weakened, the moral fiber is impaired, independency is taken away; all this resulting in lowered standards of morals, education, and citizenship.

While the museum is primarily for the education of the employer and the employee, in pointing out to the former what safety devices he should install, and showing the latter how to use them when provided, there is another important function in the inculcation of safety and caution upon the community. Impairment of the wage-earning efficiency of the individual entails a social obligation, through the provision and maintenance of the hospital, with its first aid, ambulance, and other service; the children of the injured man may be compelled to leave school to go to work; charity must intervene to provide for the relief of dependent relatives. All this means an increased burden on the municipal departments of charity, health, and police.

The American Museum of Safety was incorporated by a special charter from the legislature, chapter 152 of the laws of 1911 of the State of New York:

> The objects of the corporation hereby created are to study and promote means and methods of safety and sanitation and the application thereof to any and all public or private occupations whatsoever, and of advancing knowledge of kindred subjects; and to that end to establish and maintain a museum, library, and laboratories, and their branches, wherein all matters, methods, and means for improving the general condition of the people as to their safety and health may be studied, tested, and promoted, with a view to lessening the number of casualties and avoiding the causes of physical suffering and of premature death, and to disseminate the results of such study, researches, and test by lectures, exhibitions, and other publications.

The museum is noncommercial; it is not a showroom for patented safety devices; it does not sell or take orders for any of the devices in its collections; all demonstrations are made by its own staff; and there is no charge for space. Arthur Williams is president and James Speyer treasurer.

The museum is devoted to the safety, health, and welfare of industrial workers and the technique and science of industry. With this end in view, its operations are divided into three great departments: Accident prevention, industrial hygiene, mutuality.

The exhibits in the department of accident prevention are divided into two groups:

I. General: Boilers, containers, steam piping; power machines; transmission; electricity; elevators and hoists; fire and explosions; personal equipment of workmen; miscellaneous.

II. Particular: Mining; quarrying, excavation; blast furnace and foundry; metal working; wood working; chemical industries; stones and clays; textiles and clothing; paper and printing; foodstuffs; agriculture; building trades; transportation by land; transportation by sea; first aid to the injured.

Industrial hygiene.—Apparatus and instruments for the testing of air, light, and water; exposition of substances detrimental to

health; lighting; ventilation; exhaust for dust and gases; infectious diseases—tuberculosis; baths, dining rooms and clothing; water-closets and lavatories; personal equipment of the worker; miscellaneous.

Mutuality or social hygiene.—Improved dwellings; service annuities; foodstuffs; miscellaneous.

A jury of experts in each group will pass on the suitability of all exhibits, which must have safety or industrial hygienic essentials.

The museum provides demonstrators, descriptive circulars, care, and maintenance. All cost of transportation to and from the museum is at the expense of the exhibitor, and all installations to be done by the exhibitor, under the direction of the museum.

The collections are open daily, except Sundays and holidays, and are free to the public; but special visits can be made to accommodate selected groups of students or workmen.

In the museum's iron and steel section, under the chairmanship of Charles Kirchhoff, may be found every phase of safety devices, in actual models or in photographs, in use in the iron and steel and allied industries: Blast furnaces; open hearth; Bessemer; blooming, rail, skelp, slabbing, galvanizing, pipe and wire mills; power stations, yards, shops; electricity and transportation. These collections are being studied by engineers, factory inspectors, and foremen, who make drawings and tracings for use in their own plants.

By special arrangement evening conferences have been held at the museum with the New York commissioner of labor and 43 inspectors, the iron and steel electrical engineers, the du Pont Powder Works' superintendents, engineers, and chemists, New York section of Institute of Mining Engineers, National Electric Light Association, Midvale steel superintendents and foremen, Society of Hungarian Engineers, and the safety committee of the United States Steel Corporation.

The museum's library contains the most highly specialized collection of books, pamphlets, photographs, lantern slides, and special reports on safety in the country. These are the facilities to be enjoyed at the museum's headquarters. On its extension side may be mentioned field work by means of free illustrated lectures on accident prevention. The iron and steel section alone has conducted an educational campaign at mills and plants, where superintendents, works managers, engineers, and foremen have assembled to learn what has been accomplished through the introduction of safety devices in their industry. In some instances the meetings have been limited to the personnel of the particular plant, no men under the grade of foremen being present. These audiences have ranged from 300 to 2,100 men, and all have been impressed with the simple and practical character of the safeguards.

The department of industrial hygiene, under the chairmanship of Dr. N. E. Ditman, now possesses what he calls the most important collection of illustrative material in America; not dead material in books and statistical studies, but actual anatomical specimens or models in wax, showing effects of occupational diseases, and, side by side, photographs and other means for teaching concretely how these diseased conditions can be prevented. There is a growing number of industrialists who are realizing the importance of what the museum can show in methods for promoting improved hygiene along economic lines, but there is still a large number of works managers who are ignorant of what hygiene engineering would accomplish for them.

Insanitary workrooms have a direct economic bearing on the output of a plant; good sanitary conditions mean that the employer has the continuous service which results in team work. The small outlay for accident prevention and better health conditions would very quickly be made up through lessened payments for accident compensation and sick benefits. The larger industries have their own laboratories for testing the noxious qualities of old materials and for the investigation of new. But for the thousands of smaller plants an organization like the museum is a necessity.

The hygienic elevation of the masses comes within the scope of Federal, State, and city aid, but these directing forces of political and social life are almost powerless to control the sanitary habits of the individual. Educating him by demonstration and persuasion is the work of the Museum of Safety.

The rapid growth of industry has brought about a new science—industrial hygiene. Occupational diseases have been known for a long while, but scientific research as to their causes and effects is a recent activity. The fund of knowledge so far acquired has been the basis for social legislation. Social hygiene, in its newer development, is constantly evoking new facts, thanks to the diffusion of technical knowledge and the rise of new industries.

For example, the improved sanitation of woodworking shops by means of a system of exhausts for the dust from saws, planers, shapers, and other machines with rapidly revolving knives or tools is comparatively new. The Germans have just discovered that certain obscure diseases among woodworkers are due to the noxious qualities of the woods on which they work. Given exact knowledge of work conditions, the dangers are recognized and the way paved for their elimination. This, in turn, means that the inquiry must be pushed back to a study of the environments in which the workman lives; in other words, what is connoted by the term social hygiene.

ANNUAL RECOGNITION.

With a view to stimulating invention and installation of safety devices in all industries and the promotion of sanitation, certain friends of the American Museum of Safety have established prizes or awards, to be bestowed under its direction:

The Scientific American medal of the American Museum of Safety: A medal to be presented to such individual or corporation as has produced and exhibited in the American Museum of Safety, within a recent period of years, any perfected device of utility which, in the judgment of the jury of awards of said museum, best conserves human life and limb in the processes of productive industry or other vocations.

This medal has been awarded, in 1908, to the Rich Marine Fire Extinguishing Co.; in 1910, to the Patent Scaffolding Co.; and, in 1911, to the Norton Co.

The second medal is the Travelers' Insurance Co.'s medal of the American Museum of Safety: A medal to be awarded to the American employer or the manufacturing or other corporation which, in the judgment of the jury of awards of the American Museum of Safety, has, during a recent period of years, done the most or achieved greatly for the conservation of the lives and limbs of workmen by means of safety devices for machines and processes.

This medal was awarded in 1910 to the United States Steel Corporation and in 1911 to the Pennsylvania Railroad Co.

The third medal is the Louis Livingston Seaman medal of the American Museum of Safety: A medal for progress and achievement in the promotion of hygiene and sanitation and the mitigation of the evils of occupational disease. It was awarded in 1911 to Dr. A. H. Doty.

The Emil Rathenau medal has been placed at the disposal of the American Museum of Safety by the Allgemeine Electricitaets Gesellschaft, Berlin, to be awarded annually for the best device or process in the electrical industry for safeguarding industrial life and health. It was awarded for the first time at the museum's annual meeting in January, 1913, to Mr. Thomas Alva Edison.

A new medal, the E. H. Harriman Memorial Gold Medal, has been founded by Mrs. Harriman for annual award to the American steam railway making the best record in accident prevention and industrial hygiene, affecting the public and its own personnel, during the current year.

Competitors for all medals will be required to announce themselves as such at least 30 days in advance of the day on which the award shall be made public.

CONDITIONS OF THE COMPETITION.

Within the limits set by the terms of the gift of these medals, and also as a guide in accepting material for exhibition in the American Museum of Safety, the jury of awards has established requirements which must attach to exhibits and medal competitions:

1. Applicability; wide or narrow: Does the device procure safety for a large number of persons or in a great variety of conditions?

2. Practicability: It must be capable of being used economically and successfully. It must not be too cumbrous or intricate to apply or to operate.

3. Simplicity: It must not be so complicated that experts are required to handle it or to keep it in repair and operation.

4. Reliability: It must not be liable to derangement, causing failure to work in emergencies.

5. Durability: It must not be so delicate or require such fine adjustment that when installed it will not last in service.

6. Commercial availability: It must not be too expensive in first cost to install or to maintain in operation, and in general it must be obtainable by purchase in an open market for the use of all or as an article of regular manufacture.

But the accidents in industry are greatly augmented by accidents to the general public, resulting in death, maiming, and loss of health. The toll of street accidents is alarming and presses for immediate remedies. For the nine months ending September 1 there were killed on the streets of New York City 339 persons; of this number, 117 deaths were due to wagons, 86 to street cars, and 136 to automobiles. The greatest number of these casualties affected the children. These figures are an increase of 100 per cent over the casualties for the same period last year. Large numbers of children are daily exposed to street perils.

Every year in New York City some 40,000 children leave the two upper grades to go to work. Safety and caution should be implanted in the minds of these young people before they leave school, so that their wage-earning capacity may be conserved for themselves, their families, their employers, and their city. The museum has perfected plans to carry this safety and caution work into the public schools.

In the summer of 1912, with the consent of Hon. William H. Maxwell, Superintendent of the Board of Education for New York, several classes of vacation school children, accompanied by their teachers, visited the American Museum of Safety. The delight and interest of the children, who wanted to come again, and the indorsement by their teachers of the demonstration of devices and the manner in which the subjects of safety and caution were presented, indicated the success of this educational experiment. The children absorbed the

instruction given and replied with intelligence to the questions asked them with a view to determining if they understood the use and purpose of the devices shown them.

In the following December the museum, having received formal authorization from the board of education, carried its educational campaign for safety into the schools of the city. The museum's representatives visit the various schools and talk to the children, generally in assembly, illustrating the little stories of accidents and suggestions for caution on the streets with graphic charts and models of devices that are on exhibit at the museum. At the close of each Safety talk neat and attractive buttons bearing the insignium of the American Museum of Safety are left with the principal of the school for distribution among the children. The wearing of this button makes the child a member of the Museum's Safety League. At intervals the badges are followed by safety leaflets or stories on the special dangers of street cars, electricity, gas, automobiles, and matches, which have proved very interesting to the children and, in some instances, have served as the basis for exercises in composition and drawing. The parochial and private schools are included in this educational work, adding 150,000 children more to the 700,000 boys and girls in the regular public-school system of New York.

Accident prevention is primarily a matter of education, and the hope for the future lies in training the child to think and to act along lines of safety and caution on the street, in the shop, and at home.

There are now 22 museums of safety and institutes for the special study of industrial hygiene in Amsterdam, Barcelona, Berlin, Brussels, Budapest, Copenhagen, Dresden, Frankfort on the Main, Gratz, Helsingfors, Milan, Montreal, Moscow, Munich, New York, Paris (safety), Paris (hygiene), St. Petersburg, Stockholm, Vienna, Wurzburg, and Zurich. The American Museum of Safety in New York City is the only one in the United States.

The American Museum of Safety felt that the time had come for an international organization, which was set in motion this summer.

The headquarters of this "world clearing house for safety" will be at the Institute of Industrial Hygiene at Frankfort on the Main, under the secretary generalship of Dr. Francke. Prof. Dr. Leymann, of the ministry of the interior, has accepted the presidency. On the board of vice presidents the United States is represented by Arthur Williams, president of the American Museum of Safety.

The trustees of the museum feel that their continuous concerted educational work has been a large factor in focusing the attention of the country upon the need of the more adequate adoption of safety devices and the provision for industrial hygiene. It is, therefore,

impossible to estimate the wide-reaching influence of the inspirational force of the American Museum of Safety.

From this presentation of facts the American Museum of Safety stands to-day as the exponent of things done. It is the only concerted, organized effort in the United States for demonstrating, at the museum itself, the use of safeguards there collected; for bringing to the industrialists the knowledge of these devices, by means of manuals and leaflets of safety, special report service, and illustrated lectures. Such an institution is available for study visits by the teachers and scholars in our public schools. Its scope is twofold, namely, the education of the employees already at work and the inculcation of these principles of safety and caution in the minds of the coming generation of wage earners.

To accomplish the widest usefulness for this magnificent life-saving station, so that its practical help may be freely brought to every man, woman, and child in the United States, it should be housed under its own roof, with adequate resources for maintaining, at their highest efficiency, the three great departments of accident prevention, industrial hygiene, and mutuality. Such an institution should be for all; it should be free; it should be absolutely nonpartisan, noncommercial, and nonreligious. In the establishment of this Museum of Safety for New York State and City there is an opportunity, as never before in the history of the Western Continent, of building such a memorial as will stand for all time to all the other States of the Union, and to the entire world, as an object lesson in the conservation of human life, our most precious civic social asset.

DIE STÄNDIGE AUSSTELLUNG FÜR ARBEITERWOHLFAHRT IN CHARLOTTENBURG. (ANSTALT DES DEUTSCHEN REICHS.)

Von dem technischen Leiter der Ausstellung, Dr. Ing. h. c. KONRAD HABTMANN, Senatspräsident im Reichsversicherungs-Amt, Honorar-Professor der Kgl. Technischen Hochschule zu Berlin, Kaiserl. Geheimer Regierungsrat. Berlin—Grunewald.

Die Technik des Arbeiterschutzes ist verhältnismässig jung, sie hat sich aber in den letzten 20 Jahren hervorragend entwickelt, und es fehlt daher nicht an zweckmässigen Einrichtungen zur Verhütung von Unfällen und Gewerbekrankheiten. Zur allgemeinen Anwendung solcher bewährter Vorkehrungen ist aber eine möglichst umfassende Verbreitung der Kenntnis solcher Schutzmittel erforderlich. Besser als die Literatur vermögen Ausstellungen und Museen diese Aufgabe zu erfüllen. Es ist daher seit vielen Jahren die Forderung immer eindringlicher erhoben worden, solche Veranstal-

tungen und zwar solche dauernder Art, also Museen oder ständige Ausstellungen zu gründen.

Im Jahre 1890 wurde das von dem rühmlichst bekannten Zentralgewerbeinspektor Dr. Migerka geschaffene Gewerbehygienische Museum in Wien eröffnet, kleinere Museen entstanden in Zürich und Amsterdam.

In Deutschland reichen die Vorläufer der Ständigen Ausstellung für Arbeiterwohlfahrt in die siebziger Jahre des verflossenen Jahrhunderts zurück. Sammlungen von empfehlenswerten Einrichtungen des Arbeiterschutzes wurden an verschiedenen Orten vorgeführt.

Im Reichsversicherungsamt wurde 1887 von seinem technischen Mitgliede, dem früheren Preussischen Gewerberat Reichel eine Sammlung für Unfallverhütung eingerichtet, in der im wesentlichen von Fabrikanten angebotene Schutzvorrichtungen zur Ausstellung gebracht wurden. Auch die bald darauf in Berlin errichtete Zentralstelle für Arbeiterwohlfahrtseinrichtungen begründete eine für ihr besonderes Gebiet wertvolle Sammlung. Mehr aber als alle diese Veranstaltungen wurde von Bedeutung die Deutsche Allgemeine Ausstellung für Unfallverhütung vom Jahre 1889, die weitesten Kreisen die Wichtigkeit der vorbeugenden Arbeiterfürsorge vor die Augen führte.

Seit dieser in hohem Masse erfolgreichen Ausstellung ist in Deutschland der Wunsch nach einer ständigen Ausstellung für Arbeiterwohlfahrt nicht mehr verstummt. Die deutsche Volksvertretung brachte der Frage ein stetig wachsendes Interesse entgegen. Als eifrige Wortführer des Planes können der damalige Abgeordnete, nachmalige preussische Handelsminister Möller und der Kommerzienrat Rösicke genannt werden, der bereits für die Ausstellung für Unfallverhütung des Jahres 1889 die treibende Kraft gewesen war. Von ausschlaggebender Bedeutung war die Reichstagsverhandlung vom 28. Januar 1899, in der gelegentlich der Beratung des Etats für das Reichsamt des Innern Redner der verschiedensten Parteien, darunter ausser den Vorgenannten der bekannte Sozialpolitiker Professor Dr. Hitze, der Freiherr von Stumm und der Abgeordnete Wurm sich lebhaft für die Verwirklichung des Gedankens aussprachen, ohne von irgendeiner Seite einem Widerspruch zu begegnen.

Diesem einmütigen Wunsche des Reichstages folgte die Berücksichtigung durch den Bundesrat unmittelbar.

Die Kosten für die Einrichtung, Unterhaltung und Verwaltung der Ausstellung wurden anstandslos bewilligt. Sie betrugen für den Bau in seiner gegenwärtigen Gestalt einschliesslich eines im Jahre 1908 fertiggestellten Erweiterungsbaues 744,500 M., sodass einschliesslich der Kosten für Grund und Boden der Gesamt auf-

wand für die Erstellung des Gebäudes 1,222,500 M. betragen hat. Die für die Verwaltung aufgewendeten Kosten belaufen sich zur Zeit jährlich auf 45,000 M.

Die Baulichkeiten setzen sich aus dem Verwaltungsgebäude und der Ausstellungshalle zusammen, die miteinander durch einen Vorraum verbunden sind, über dem sich der Hörsaal befindet. Das Verwaltungsgebäude enthält ausser den Büroräumen und der Wohnung des Hausverwalters im oberen Stocke Räume für Sonderausstellungen. Der 196 Sitzplätze fassende Hörsaal ist hauptsächlich für Vorträge aus dem weiten Gebiete der Arbeiterwohlfahrt bestimmt. Die Ausstellungshalle, die zur ebenen Erde einen Ausstellungsraum von 2531 qm. zur Verfügung stellt, ist mit einer Galerie versehen, die eine Ausstellungsfläche von 1212 qm. bietet.

Die Eröffnung der Ausstellung erfolgte am 18. Juni 1903 durch den damaligen Staatssekretär des Innern Grafen von Posadowsky-Wehner.

Für die innere Ausgestaltung der Ausstellung war der Weg gewiesen, den der Herr Staatssekretär des Innern im Reichstage mit markanten Linien vorgezeichnet hatte. Nicht um eine Ausstellung des Reiches sollt es sich handeln, sondern um eine unter der Leitung des Reiches von Erfindern und Fabrikanten veranstaltete Ausstellung; nicht ein Museum toter Gegenstände sollte geschaffen werden, sondern eine Ausstellung voll Leben und Bewegung. Wo immer die Möglichkeit bestand, Maschinen in natürlicher Grösser und im Betriebe vorzuführen, war von der Ersetzung durch Modelle abzusehen, die doch niemals—auch nicht für die Anschauung—einen vollen Ersatz bieten können. Wo Altes durch besseres Neues verdrängt wird, soll das Alte dem Neuen den Platz räumen, damit die Ausstellung stets mit der Entwickelung des praktischen Lebens gleichen Schritt halten kann. So wird die Besucher in der Ausstellungshalle nicht die feierliche Stille eines Museums umfangen, in dem ihnen wertvolle Dokumente menschlichen Geistes aus vergangener Zeit gezeigt werden, sondern das Geräusch der Transmissionen, das Surren der Räder wird an ihr Ohr klingen, die Musik, die, alles übertönend, in tausend und abertausend Betrieben die gewerbliche Arbeit begleitet.

Bei der Zulassung der Ausstellungsgegenstände ist die Verwaltung nach den eben bezeichneten Grundsätzen verfahren, wesentlich unterstützt hierin von einem ihr beigegebenen Beirat.

Nach dem der Ausstellung zugrunde liegenden Gedanken, nicht nur das Gebiet der Unfallverhütung, sondern vielmehr das der gesamten Arbeiterwohlfahrt zu umfassen, zerfällt sie in zwei grosse Abteilungen.

Die grössere Abteilung ist der Darstellung des Unfallschutzes in den verschiedensten Industriezweigen und in der Landwirtschaft gewidmet. Es ist davon ausgegangen, dass nur solche Einrichtungen vorgeführt werden, die bereits in den Betrieb Eingang gefunden haben, so dass sie in der Tat ein Bild von dem augenblicklichen Stande der Unfallverhütungstechnik gewähren. Ferner ist besonderer Wert darauf gelegt worden, die Sicherheitseinrichtungen soweit wie möglich in betriebsmässiger Ausführung zu zeigen. Bei manchen Einrichtungen musste allerdings mit Rücksicht auf die Raumverhältnisse auf die Vorführung in der ihrer praktischen Verwendung entsprechenden Grösse abgesehen und die Darstellung durch Modell, Zeichnung oder Photographie gewählt werden. Auch sonst musste, um ein möglichst vollständiges Bild der Unfallverhütungstechnik bieten zu können, diese Darstellungsweise mehrfach zu Hilfe genommen werden. Bei der Vorführung von Einrichtungen der Unfallverhütung in natürlicher Grösse wurde ferner darauf gehalten, dass diese Vorkehrungen, soweit es im Rahmen einer Ausstellung durchführbar ist, unter denselben Arbeitsbedingungen gezeigt werden, wie sie der praktische Betrieb ergibt. Es sind daher nahezu alle in betriebsmässiger Form vorgeführten Maschinen, deren Gesamtzahl zur Zeit etwa 200 beträgt, mit Kraftantrieb versehen, soweit sie nicht für Handbetrieb eingerichtet sind. Mehrere grössere Elektromotoren treiben je eine Transmissionswelle, von der aus die Maschinen durch Riemen bewegt werden. Ausserdem sind zahlreiche Elektromotoren für den direkten Antrieb einzelner Maschinen und Modelle angeordnet.

Die im Betrieb vorgeführten Maschinen sind sämtlich im unteren Teile der Ausstellungshalle aufgestellt; auf der Galerie haben zahlreiche Apparate, Modelle und Abbildungen Platz gefunden.

Die zweite Hauptabteilung der Ausstellung umfasst das Gebiet der Gewerbehygiene und der mit ihr in den vielfachsten Beziehungen stehenden sozialen Hygiene. Es handelt sich hier einmal um die Vorführung wissenschaftlicher Instrumente, anatomischer Präparate und verwandter Darstellungen, dann aber wesentlich auch um die Vorführung solcher Einrichtungen, die, wie z. B. die Einrichtungen zur Beseitigung gesundheitsschädlicher Beimengungen der Luft in Staub- und Gasform, die Arbeiter gegen krankmachende Einflüsse schützen sollen, um Bade- und Wascheinrichtungen, Speise- und Ankleideräume in Fabriken und sonstige der Gesundheitspflege in Betrieben dienende Veranstaltungen. Auch der Ernährungsfrage, dem Wohnungswesen und der übrigen Fabrikwohlfahrt im weitesten Sinne sind besondere Darstellungen gewidmet.

Um den Besucher auf die insbesondere der Unfallverhütung dienenden Teile der ausgestellten Gegenstände sofort aufmerksam zu machen, sind diese Teile durch roten Anstrich kenntlich gemacht.

Für die der Ableitung von gesundheitsschädlichen Staubteilen, Dämpfen und Gasen dienenden Vorrichtungen ist ein blauer Anstrich gewählt worden, um auch sie leicht erkennbar zu machen.

Sämtliche Ausstellungsgegenstände sind mit kurzen erläuternden Beschreibungen versehen, die bei den Photographien auf diesen selbst angebracht sind, während sie bei den Maschinen, Apparaten und Modellen in Form loser Blätter zum Mitnehmen ausliegen. Den Besuchern werden Heftdeckel mit einem metallenen Schnellhefter kostenlos zur Verfügung gestellt. Mit ihrer Hilfe kann sich jeder nach seinen eigenen Wünschen eine Auswahl der ausliegenden Blätter zusammenstellen. Ausserdem gibt die Verwaltung einen jährlich neu bearbeiteten Katalog heraus, in dem sämtliche Aussteller mit kurzer Angabe des Ausstellungsgegenstandes, nach einzelnen Gruppen geordnet, aufgeführt sind. Der Katalog steht den Besuchern ebenfalls kostenlos zur Verfügung.

Von den im Obergeschosse des Verwaltungsgebäudes zur Verfügung stehenden Räumen sind zwei zur Zeit dem " Deutschen Zentralkomitee für Lungenheilstätten " für eine Ausstellung überlassen, in der alles das zusammengestellt ist, was sich auf die Tuberkulosebekämpfung ausserhalb der Fabrik bezieht. Ein dritter Raum beherbergt zur Zeit eine vom " Deutschen Verein gegen den Missbrauch Geistiger Getränke " veranstaltete Ausstellung von Einrichtungen und Schriften zur Bekämpfung des Alkoholmissbrauchs.

Die Ständige Ausstellung für Arbeiterwohlfahrt ist eine Reichsanstalt und untersteht als solche dem Reichsamte des Innern. Die Verwaltung und Leitung erfolgt ehrenamtlich und zwar die Verwaltung durch Dr. Leymann, Geheimer Regierungsrat und vortragender Rat im Reichsamte des Innern, die Technische Leitung durch den Dr. Ing. h. c. Hartmann, Senatspräsident im Reichsversicherungsamte, Geheimer Regierungsrat, Honorar-Professor der Kgl. Technischen Hochschule zu Berlin.

Als Hilfsarbeiter sind tätig Professor Dr. Albrecht, Geschäftsführer der Zentralstelle für Volkswohlfahrt, Dipl.-Ingenieur Ernst, Königlicher Regierungsbaumeister.

In der Ausgestaltung der Ständigen Ausstellung wird die Leitung wesentlich von einem Beirat unterstützt, dessen Aufgabe es ist, bei der Ausgestaltung und Nutzbarmachung der Ausstellung mitzuwirken; er wird je nach Bedarf einberufen.

Vorsitzender des Beirats ist Dr. Casper, Excellens, Wirklicher Geheimer Rat, Direktor im Reichsamte des Innern. In diesen Beirat wurden berufen Vertreter des Kgl. Preussischen Handelsministeriums, des Reichsversicherungsamts (darunter auch mehrere Arbeitervertreter) und des Kaiserl. Gesundheitsamts, der staatlichen Gewerbeaufsicht aus mehreren Bundesstaaten, der Berufsgenossenschaften und ihrer technischen Aufsichtsbeamten, der Zentralstelle für Volks-

wohlfahrt und der Ständigen Ausstellungskommission für die Deutsche Industrie.

Um den einzelnen Mitgliedern des Beirats mehr Gelegenheit zur Betätigung zu geben, andererseits auch, um die Sachkenntnis und den Einfluss der Mitglieder im Interesse der Ausstellung nutzbar zu machen, ist der Beirat in einzelne Fachkommissionen geteilt. Diese Fachkommissionen werden je nach Bedarf einberufen und unterziehen gemeinschaftlich mit der Technischen Leitung die ihnen zugewiesene Gruppe von Ausstellungsgegenständen einer eingehenden Prüfung nach der Richtung, ob das Vorhandene zur gegebenen Zeit noch der Entwickelung der Praxis auf dem betreffenden Gebiet entspricht. Ferner sollen sie aus ihrer praktischen Erfahrung heraus auf Neuerungen, die etwa der Technischen Leitung nicht bekannt geworden sind, aufmerksam machen und gegebenenfalls bei der Heranziehung solcher Gegenstände mitwirken.

Zur Zeit bestehen neun Kommissionen, und zwar für Allgemeines und Transportwesen, Bergbau, Hüttenwesen, Metallbearbeitung, Holzbearbeitung, Chemische Industrie, Industrie der Nahrungs- und Genussmittel, Textil- und Bekleidungsindustrie, Baugewerbe, Gewerbehygiene, Soziale Wohlfahrtseinrichtungen.

Unter dem Personal befinden sich zwei Werkmeister, die als Führer durch die Ausstellung während der Besuchszeiten jedem Besucher unentgeltlich zur Verfügung stehen.

Die Ausstellungsgegenstände sind in 32 Gruppen in den Ausstellungsräumen untergebracht.

Ende des Jahres 1910 betrug die Anzahl der Aussteller und der von ihnen ausgestellten Gegenstände etwa:

Gruppe.		Anzahl der Aussteller.	Anzahl der Ausstellungsgegenstände.			
			In Natürlicher Grösse.	Als Modell.	In Zeichnung und Photographie.	Zusammen.
1	Dampfkessel, Dampfgefässe, Dampfleitungen	40	68	.....	33	101
2	Kraftmaschinen	44	9	7	44	60
3	Transmissionen und elektrische Kraftübertragung } bisher vereinigt	57	54	14	32	100
4	Elektrotechnik }					
5	Fahrstühle und Hebezeuge	60	32	13	54	99
6	Schutz gegen Feuers- und Explosionsgefahr	32	34	4	23	61
7	Persönliche Ausrüstung des Arbeiters gegen Unfallgefahr (vgl. auch Gruppe 28)	46	70	.....	35	105
8	Verschiedenes	8	10	.....	.....	10
9	Bergbau, Steinbrüche und Gräbereien	45	60	24	58	142
10	Hüttenwesen, Giesserei	18	6	13	34	53
11	Metallbearbeitung	50	45	12	48	105
12	Holzbearbeitung	38	35	15	23	73
13	Chemische Industrie	27	36	5	17	58
14	Industrie der Steine und Erden	8	8	7	14	29
15	Textil- und Bekleidungsindustrie	39	30	11	38	79
16	Papierindustrie und polygraphische Gewerbe	17	10	.....	14	24
17	Industrie der Nahrungs- und Genussmittel	52	20	6	71	97
18	Land- und Forstwirtschaft	17	24	2	43	6

Gruppe.		Anzahl der Aussteller.	Anzahl der Ausstellungsgegenstände. In Natürlicher Grösse.	Als Modell.	In Zeichnung und Photographie.	Zusammen.
19	Bauwesen	20	18	7	20	45
20	Transport zu Lande	20	13	12	20	45
21	Schiffahrt	9	10	2	13	25
22	Erste Hilfe bei Unfällen	15	15	2	4	21
23	Wissenschaftliche Apparate zur Untersuchung von Luft, Helligkeit usw.	12	25	.....	.....	25
24	Darstellungen durch den Gewerbebetrieb bedingter Gesundheitsschädigungen und ihrer Ursachen	1	[1] 60	.....	.....	60
25	Einrichtungen zur Lüftung und Freihaltung der Arbeitsräume von Staub und Gasen	61	32	20	51	103
26	Wasch- und Badeeinrichtungen, Ankleide- und Speiseräume nebst Einrichtungsgegenständen	24	23	5	12	40
27	Abortanlagen	2	10	.....	.....	10
28	Verschiedene Einrichtungen zur Verhütung von gewerblichen Erkrankungen	11	15	1	2	18
29	Persönliche Ausrüstung des Arbeiters zum Schutze gegen Gesundheitsschädigungen	23	40	.....	14	54
30	Wohnung und Unterkunft	24	.....	9	62	71
31	Ernährung	20	27	2	10	39
32	Andere Fürsorge- und Wohlfahrtseinrichtungen	16	.....	4	43	47
	Zusammen	856	839	197	822	1,858

[1] Sechzehn Darstellungen.

Unter Berücksichtigung der im Jahre 1911 erfolgten Neuerungen und Auswechslungen betrug die Anzahl der Aussteller und der von ihnen ausgestellten Gegenstände am Ende des Jahres 1911 etwa:

	Aussteller.	Ausstellungsgegenstände. In Natürlicher Grösse.	Als Modell.	In Zeichnung und Photographie.	Zusammen.
Vorhanden Ende 1910 (vgl. Tab.)	856	839	197	822	1,858
Neue Gegenstände von bereits vertretenen Ausstellern, ohne Berücksichtigung des Austauschs gegen veraltete Gegenstände	.....	25	3	19	47
Neue Gegenstände von bislang nicht vertretenen Ausstellern	82	111	27	80	218
Demnach vorhanden Ende 1911	938	975	227	921	2,123

Die bei der Begründung der Ausstellung vom Reichsversicherungsamt überwiesene Sammlung von etwa 1000 photographischen Aufnahmen der verschiedensten Schutzvorrichtungen gegen Unfälle ist von Grund aus erneuert. Wie bei den in natürlicher Form augestellten Maschinen und Apparaten sind auch bei den neuen Photographien die der Unfallverhütung dienenden Teile rot, die der Ableitung gesundheitsschädlicher Luftbestandteile dienenden Vorrichtungen blau übermalt. Es ist hierdurch auch dem Nichtfachmanne wesentlich erleichtert, sich zurechtzufinden.

Ein interessantes Vergleichsmaterial zu dieser Sammlung bietet eine Serie von gleichfalls etwa 1000 photographischen Aufnahmen, die Unfallverhütungsvorrichtungen in den Vereinigten Staaten von Nordamerika darstellen. Die Sammlung bildete einen Ausstellungsgegenstand der Internationalen Hygieneausstellung Dresden 1911 und wurde nach Schluss derselben durch Herrn Dr. Tolman, Direktor des Museum of Safety in New York, in freundlichster Weise der Ständigen Ausstellung für Arbeiterwohlfahrt überwiesen.

Genaue Angaben über die in den einzelnen Gruppen ausgestellten Maschinen und Gegenstände sowie über die Aussteller finden sich in dem von der Verwaltung jährlich neu herausgegebenen Kataloge, der auf Wunsch unentgeltlich zur Verfügung steht.

Die Ausstellungsbedingungen sind folgende:

1. Zur Ausstellung zugelassen sind solche Einrichtungen zur Unfallverhütung und sonstige Vorkehrungen zum Schutze von Leben und Gesundheit sowie zur Förderung der sozialen Lage der Arbeiter, die von den Ausstellern in ihren Betrieben eingeführt sind oder fabrikmässig hergestellt werden.

2. Der Raum für die Ausstellung der benannten Gegenstände wird unentgeltlich zur Verfügung gestellt.

3. Ueber die Zulassung der auszustellenden Gegenstände entscheidet—erforderlichenfalls nach Anhörung des vom Reichskanzler berufenen ständigen Beirats von Sachverständigen—die dem Reichsamte des Innern unterstellte Verwaltung.

4. Die Gegenstände können in Photographie, Zeichnung, Modell oder in natürlicher Grösse und die Maschinen im Betriebe vorgeführt werden.

Die hierzu erforderliche Kraft wird kostenlos zur Verfügung gestellt.

5. Die Verwaltung übernimmt:

(*a*) Die Sorge für die der Belehrung der Besucher Rechnung tragende Vorführung der Maschinen.

(*b*) Die Anfertigung und Drucklegung der den Ausstellungsgegenständen beizugebenden Erläuterungen, für welche die Unterlagen von den Ausstellern zu liefern sind.

(*c*) Die Bewachung und die Instandhaltung der Ausstellungsgegenstände.

(*d*) Die Verwaltung haftet für die Beschädigungen der Ausgestellten Gegenstände durch Feuer.

6. Den Ausstellern liegt die Anbringung einer entsprechenden Bezeichnung der Ausstellungsgegenstände durch ein nach Vorschrift der Verwaltung herzustellendes Firmenschild ob.

7. Die Verwaltung trägt keine Verantwortlichkeit für etwaige Diebstähle oder für Beschädigungen, die den Gegenständen ohne Verschulden der Angestellten der Ausstellung zugefügt werden.

8. Die Ausstellungsgegenstände können jederzeit nach vorausgegangener schriftlicher Benachrichtigung der Verwaltung zurückgenommen werden.

9. Sofern sich ergibt, dass die in der Ausstellung befindlichen Maschinen, Apparate und Einrichtungen durch neuere Erfindungen überholt sind oder dass sie sich in der praktischen Anwendung als nicht zweckmässig erweisen, oder sofern sonst Gründe vorliegen, welche die Entfernung eines Ausstellungsgegenstandes wünschenswert erscheinen lassen, sind die Gegenstände auf Ersuchen der Verwaltung zu entfernen.

10. Die Kosten für Hin- und Rücktransport der Ausstellungsgegenstände fallen den Ausstellern zur Last. Die Montage der Maschinen, Apparate u. s w. ist von den Ausstellern zu bewirken; die der Ausstellung zur Verfügung stehenden Arbeitskräfte werden dabei nach Möglichkeit hilfreiche Hand leisten.

Der Besuch der Ausstellung hat sich in recht erfreulicher Weise entwickelt. Die überwiegende Mehrzahl der Besucher stellt natürlich Berlin und seine nächste Umgebung, doch ist besonders in den letzten Jahren der Besuch von ausserhalb, insbesondere auch vom Ausland, ein bemerkenswert hoher. Um den Besuch der Ausstellung für die Besucher so nutzbringend wie möglich zu gestalten, stellen sich die Beamten der Ausstellung, soweit es irgend durchführbar ist, persönlich zur Verfügung, um Gruppen von Besuchern, die sich zu diesem Zwecke vorher anmelden, zu führen und ihnen die wünschenswerten Erläuterungen zu geben.

Es wird auch durch gelegentliche Hinweise in der Presse und durch persönliche Beziehungen der Mitglieder der Verwaltung nach Möglichkeit darauf hingewirkt, Fachvereinigungen, die Teilnehmer an Fortbildungskursen aller Art, die Studierenden an höheren und mittleren Lehranstalten und vor allem auch die Arbeiterkreise zu solchen gruppenweisen Besichtigungen der Ausstellung anzuregen.

Auf Anregung des Reich'sversicherungsamts senden die Berufsgenossenschaften, also die zur Durchführung der Unfallversicherung errichteten Vereinigungen der Betriebsunternehmer, ihre Beamten zum Studium nach der Ausstellung.

Ebenso dient die Ausstellung den Beamten der staatlichen Gewerbeaufsicht zur Kenntnisnahme der Neuerungen in der Arbeiterschutztechnik. Regelmässige Führungen werden ferner u. a. veranstaltet von der Zentralstelle für Volkswohlfahrt, ferner für die Hörer der Königlichen Technischen Hochschule zu Berlin, der Königlichen Kriegsakademie, sowie zahlreicher Fortbildungsschulen.

Im Berichtsjahre 1911 wurde die Ausstellung von insgesamt 26,253, und zwar von 25,257 männlichen und 996 weiblichen Personen besucht.

Die Bibliothek der Ständigen Ausstellung für Arbeiterwohlfahrt zählt gegenwärtig rund 600 Bände. Ihrem Zwecke entsprechend enthält sie in der Hauptsache nur Werke, die das Gebiet des Unfallschutzes, der Gewerbehygiene und der sozialen Hygiene behandeln.

Daneben ist eine Auslage von Fachzeitschriften und Verwaltungs- und Jahresberichten der Berufsgenossenschaften eingerichtet. Die Jahresberichte der Berufsgenossenchaften enthalten wertvolle Angaben über neu eingeführte, brauchbare Schutzvorrichtungen und ermöglichen dadurch ein gründliches Studium der Neuerungen.

Bibliothek und Fachzeitschriftenauslage stehen während der Besuchszeit jedem Besucher unentgeltlich zur Verfügung. Auch werden die Bücher nach vorherigem Ausweis und gegen Empfangsbescheinigung auf kurze Zeit ausgeliehen.

Die Bedeutung der Ständigen Ausstellung für Arbeiterwohlfahrt für weitere Kreise erhellt auch daraus, dass die Verwaltung vielfach um Auskunft angegangen wird, die sich namentlich auf die Nennung von Bezugsquellen für bewährte Einrichtungen der Unfallverhütung und der Gewerbehygiene beziehen. Zur eigenen Orientierung sowie besonders, um den einzelnen Gewerbetreibenden zu ermöglicher, sich ohne zeitraubende Umfragen bei einzelnen ihm gerade bekannten Firmen über die Preise, Bezugsbedingungen u. s. w. von Maschinen und Apparaten zu orientieren, ist eine Auslage von Prospekten und Katalogen von Firmen eingerichtet, die als Bezugsquellen in Betracht kommen können. Diese Auslage ist der Bibliothek angegliedert und steht wie diese jedem Besucher während der Besuchszeit der Ausstellung unentgeltlich zur Verfügung.

Von besonderem Werte für diese Sammlung ist das von Herrn Professor Dr. Schlesinger gelegentlich der Bearbeitung seines Werkes "Unfallverhütung und Betriebssicherhert" gesammelte Material, das dieser freundlichst zur Verfügung stellte. Ebenso hat Herr Senatspräsident Prof. Dr. Ing. h. c. K. Hartmann eine schon früher angelegte Sammlung dieser Art bereitwilligst überlassen.

Der 196 Sitzplätze fassende Hörsaal des Verwaltungsgebäudes dient vornehmlich zur Veranstaltung von Vorträgen. Es werden von Zeit zu Zeit allgemeinverständliche Vorträge über solche Themata gehalten, die mit den Zielen der Ausstellung in engerem Zusammenhange stehen.

Auch sonst wird der Hörsaal bei geeigneten Anlässen für Vortragszwecke nutzbar gemacht, so z. B. zur Abhaltung des von dem Herrn Minister für Handel und Gewerbe alljährlich veranstalteten Informationskursus für Gewerbeaufsichtsbeamte, wobei die Ausstellung selbst ein willkommenes Demonstrationsmaterial liefert.

Ferner werden des öfteren in Ergänzung von grösseren Gruppenführungen kurze Besprechungen über das in der Ausstellung

Vorgeführte abgehalten, wobei ein oft lebhafter Meinungsaustausch über Vorzüge oder Nachteile einer gerade besonders interessierenden Sicherheitseinrichtung stattfindet. Der Verwaltung werden hierdurch gleichzeitig wertvolle Anregungen für Aenderungen, Neubeschaffung u. s. w. geboten.

Die Verwaltung ist seit der Begründung der Ausstellung des öfteren in die Lage gekommen, sich an auswärtigen Ausstellungen zu beteiligen.

Das erste Mal war dies der Fall gelegentlich der 1904 veranstalteten Ausstellung für Unfallschutz und Gewerbehygiene in Luxemburg, bei welcher Gelegenheit zahlreiche Photographien von Schutzvorichtungen ausgestellt wurden. Im gleichen Jahre wurde auf der Weltausstellung in St. Louis durch geeignete Photographien auf die Bestrebungen und das Wirken der Ausstellung hingewiesen. Sodann brachte die Verwaltung gelegentlich der Eröffnung des Museums des Grossherzoglich Badischen Tuberkulosevereins in Karlsruhe in November 1904 den Staubschutz in Fabrikbetrieben in Modellen, Zeichnungen und einzelnen betriebsfähigen Absaugungsvorrichtungen zur Darstellung. An der vom August bis Oktober 1907 währenden Internationalen Ausstellung für Unfallverhütung, Gewerbehygiene und Arbeiterwohlfahrt in Budapest beteiligte sich die Ständige Ausstellung für Arbeiterwohlfahrt durch eine Sammlung von 650 Photographien, die den Arbeiterschutz zur Darstellung brachten. Diese Sammlung wurde nach Schluss der Budapester Ausstellung dem Königlich Ungarischen Sozialmuseum in Budapest zur Bereicherung der dortigen Sammlung überwiesen.

In der Internationalen Hygieneausstellung in Dresden 1911 ist die Ständige Ausstellung für Arbeiterwohlfahrt in einer Gruppe von Photographien vorgeführt worden, die ein Bild von der baulichen Anlage und der inneren Ausgestaltung gab. Eine Schrift erläuterte Zweck, Umfang und Inhalt der Ausstellung.

Die Ständige Ausstellung hat auch für das Ausland Bedeutung erlangt. Alljährlich kommen Hunderte von Ausländern zum Studium nach der Ausstellung und nach ihrem Vorbilde sind in Paris, Stockholm, Budapest, Moskau, New York Museen gegründet worden, die der Förderung der Technik des Arbeiterschutzes und der Arbeiterwohlfahrt dienen.

Die Ausstellung ist geöffnet: An den Wochentagen (mit Ausnahme des Montags) vormittags 10 Uhr bis nachmittags 1 Uhr, Dienstags und Donnerstags ausserdem abends von 6–9 Uhr, an den Sonntagen: Nachmittags 1–5 Uhr. Der Besuch ist unentgeltlich.

SANITARY CONTROL OF AN INDUSTRY BY THE INDUSTRY ITSELF.

LILLIAN D. WALD, head resident nurse, Henry Street Settlement, New York City.

The cloak and suit industry in New York City is one of the most important of the garment-working trades, reported to have an output of $250,000,000 a year and employing from 60,000 to 70,000 people at the height of the season.

The industry is highly organized, the trade-unions controlling some 95 per cent of the employees. The employers in part are organized in the Manufacturers' Protective Association, the members of which are said to control over 60 per cent of the output.

Though the workers have shown great ability in the last two years in holding their organization together, they are much affected by the influx of immigration, probably more so than any other trade, as it is estimated that fully 10,000 immigrants per year are absorbed by this industry; and the leaders of the trade-unions have the enormous task of harmonizing the different nationalities, teaching them the purposes and importance of collective bargaining, and of loyalty to the organization. They suffer also from the lack of permanency even among the leaders. However, there have been satisfactory demonstrations of the ability of immigrants to comprehend their power and the importance of keeping up so-called American standards by adherence to the trades-unions.

The employers also are to some extent in this condition of flux. Contractors and manufacturers with little capital are enabled to open up "factories," many of whom are represented in the 40 per cent outside the membership of the Manufacturers' Protective Association and are in competition with them. The prosperous manufacturers, largely represented in the association mentioned, have moved out of the congested parts of the city, rent or own good lofts, furnish electric light and power, and maintain increasingly high sanitary standards. They suffer from the competition of employers of smaller capital, who to a large extent maintain the least sanitary shops and who, because of this and of their inexpensive plants, are able to manufacture at less cost and have this economic advantage over their more responsible rivals. Being less susceptible to public sentiment, they have it within their power to exploit their employees more readily.

Partly on this account the employers represented in this organization (who, though they control 60 per cent of the output of the industry, are a minority of the manufacturers) were ready to receive favorably the creation of joint responsibility of the organized bodies for decent sanitary conditions and through its power to more nearly equalize conditions of competition, the power of the

trades-unions being, of course, exercised over the shops outside of the Manufacturers' Association.

In the summer of 1910 there was a general strike in this trade which lasted nine weeks and drew into the contest sympathetic friends of both sides. The strike finally terminated in the signing of a so-called protocol of peace, according to the terms of which some interesting and hitherto untried agencies for the maintenance of industrial peace and sanitary standards were established. It was significant of the dissatisfaction with insanitary conditions in the shops that among the claims of the strikers was the demand for better regulation of their working places in this regard.

The joint board of sanitary control, established by both parties under the protocol, originated the machinery for inspection and regulation of shops and factories, and later created through the power of both organizations the means of establishing and maintaining standards of sanitation by the trade for the trade.

Before the strike of 1910 the sanitary conditions of this industry had been typical of the garment-working trades, with the exception of the larger and more prosperous establishments in the modern loft buildings to which reference has been made. The congested, insanitary places which would not admit of ventilation, regulation of light, or adequate protection from fire hazards, nor of decent toilet accommodations, were more the rule than the exception. While the sweatshop is practically eliminated in this trade in New York City, the sanitary conditions of the smaller East Side shops were not much better than the sweatshop.

Section 15 of the protocol of peace made mandatory the creation of the joint board under the following terms:

> The parties hereby establish a joint board of sanitary control, to consist of seven members, composed of two nominees of the manufacturers, two nominees of the unions, and three who are to represent the public; the latter to be named by Meyer London, Esq., and Julius Henry Cohen, Esq., and in the event of their inability to agree, by Louis Marshall, Esq.
>
> Said board to establish standards of sanitary conditions to which the manufacturers and the unions shall be committed, and which the manufacturers and the unions obligate themselves to maintain to the best of their ability and to the full extent of their power.

Very soon after the signing of this the organization was effected as ordered, with three representatives of the general public as follows: Dr. William J. Schieffelin, chairman; Dr. Henry Moskowitz, secretary; Miss Lillian D. Wald, treasurer; Dr. George M. Price, chairman of the executive committee, the representative of the trades-unions.

The attorneys for both sides, Meyer London, Esq., and Julius Henry Cohen, Esq., are present at meetings but do not vote.

Enforcement of laws relating to sanitation of buildings, conditions of employment, and so forth, is vested in various State and municipal departments: The State department of labor, the city department of health, the city department of fire—the newly created bureau of fire protection, the city department of buildings.

The efficiency of this enforcement depends upon the integrity of the inspectors, the adequacy of appropriations, and freedom from political interference in appointment and control of the agents, and also upon intelligent public approval of the laws without which even the civil-service-protected inspector can not accomplish much. Pending the attainment of greater perfection in law enforcement, agencies outside the official departments must be established to reenforce them and to maintain that eternal vigilance without which they inevitably deteriorate.

All the members of the joint board of sanitary control serve gratuitously, but employ a clerical and inspectorial staff. The members were fortunate in numbering among them an expert sanitarian, appointed by the trades-unions as their representative; and they started immediately a comprehensive, systematic investigation of all the shops in this industry in the city for the purpose of formulating and establishing standards.

The sum of $1,000 was promptly contributed by each party to the agreement (manufacturers' association and trades-unions) for this preliminary work.

The board, in addition to its membership, had the voluntary aid of some of the foremost sanitary and industrial experts in the country, who gave counsel in the organization of the work, in preparing the schedules, and, later, in making the statistical deductions. A staff of able inspectors was engaged and was specially instructed upon the social significance of their work, and, as a result, entered into it with enthusiasm.

INSPECTIONS.

The first inspection covered 1,243 shops, of which two-thirds were found defective in fire protection or sanitary conditions or both. After the preliminary investigation the more permanent policy of the board was decided upon, and an estimated yearly budget of $7,000 was met without question by the two parties, each contributing equally. In addition to this sum, money fines imposed upon workers or manufacturers for violations of shop rules, or protocol mandates, have been turned over to the treasurer of the joint board, amounting in the last year to something less than $700.

Semiannual inspections of the shops are made. The record of each shop is constantly checked up. Expert methods of administration regarding complaints, recommendations, and orders have been estab-

lished, and a complete sanitary survey of the trade is constantly on file.

The statistics of the fourth inspection have not yet been completed, but it is safe to say that most of the sanitary defects and fire dangers will be found to have been remedied.

The semiannual inspections and the continuous following up of complaints made either by the unions or the inspectors have enabled the board to improve its enforcing methods. When the routine of administrative machinery has been tried ineffectually, the manufacturer against whose shop complaint has been made is reported to the association, if he is a member, and is disciplined by that organization.

The sincerity of the manufacturers' association has been tested, and its cooperation has proven effective. It has assisted the board in securing structural changes in the shops, involving expense, sometimes serious, on the part of the manufacturer or the owner, in order to comply with the orders of the joint board.

Thirty-eight shops in the association were found to require such alterations. All but two or three have complied, and the counsel of the association will probably succeed within a short time in securing compliance from all.

METHODS OF ENFORCEMENT.

In shops not under the jurisdiction of the manufacturers' association the union is under obligation to enforce the orders of the board. If compliance can not be secured from the employer the union is instructed by the joint board to withdraw the men; and, as a result, during the first year of the board's existence, 27 sanitary strikes, involving 350 people, were called. The average duration of these strikes was a fraction over a week. Obviously, these are heroic measures, and are only taken when all other means for enforcing orders for better sanitation have been exhausted.

The usual action for the employer thus treated has been to move into better quarters that would meet with less condemnation if not with the entire approval of the joint board.

EDUCATION OF WORKERS.

Reliance upon inspection only has not been considered sufficient, and a far-reaching educational campaign, particularly among the workers, has been undertaken. This educational campaign consists of public meetings. The first one, in historic Cooper Union, attracted thousands of workers. The hall, with a capacity of 2,000 people, was crowded, and the audience overflowed to the sidewalks and adjacent streets. The audience was almost entirely composed of cloak and

suit workers, eager to hear from the lips of their trusted leaders and friends the gospel of sanitation and the possibility of promoting it.

Lectures in a large public school in the neighborhood where the greater number of the workers live, were given by experts with the cooperation of the department of education. These lectures were upon factory legislation, factory education, factory sanitation, industrial poisons. Talks on the purposes of the board and instruction in elementary hygiene were given in the shops.

Shop sanitary committees were appointed in 336 shops, and more are to follow.

Plain talks have been given to the workers by other workers, who tell them that "the body is nourished by fresh air, cleanliness, and sunlight as well as by food."

Further educational work has taken the form of publication of the joint board's bulletins and reports.

Articles have been printed in the trade papers.

Educational propaganda by the unions goes ceaselessly on through their various agencies.

The following sanitary standards were established by unanimous vote:

SANITARY STANDARDS.

1. No shop to be allowed in a cellar.
2. No shop to be allowed in rear houses or attic floors without special permission of the board.
3. Shops located in buildings two stories or more in height must have one or more fire escapes.
4. All fire escapes to be provided with ladders to the roof of same house or to an adjoining house; also with full-length drop ladders properly located and adjusted.
5. In all shops which are not provided with automatic sprinklers there should be kept a sufficient number of chemical extinguishers, or a sufficient number of fire buckets, properly located and filled.
6. Special caretakers to be appointed in each shop for the care of the fire buckets and for their use in case of fire.
7. All openings and exits to fire escapes to be left unobstructed by tables, machines, boxes, partitions, and iron bars.
8. No doors to be locked during working hours.
9. No smoking to be permitted in workshop.
10. Conspicuous signs to be placed throughout the shop marking location and direction of exits and fire escapes.
11. Fireproof receptacles, lined with tin and having a tin cover, to be provided in sufficient numbers for rubbish.
12. Halls and stairways leading from shops to be adequately lighted by natural or artificial light.
13. Stairs to be provided with secure handrails and safe treads.
14. Sufficient window space to be provided for each shop so that all parts of the shop be well lighted during the hours from 9 a. m. to 4 p. m.
15. Where gas illumination is used arc lights or incandescent mantles should be used.

16. All lights to be well shaded, to be placed above operatives, and not too near them.

17. At least 400 cubic feet of space, exclusive of bulky furniture and materials, should be provided for every person within the shop.

18. The shop should be thoroughly aired before and after work hours and during lunch hour by opening windows and doors.

19. No coal should be used for direct heating of irons, and whenever stoves are used for heating shops they should be surrounded by metal sheet at least 5 feet high.

20. Walls and ceilings of shops and water-closet apartments should be cleaned as often as necessary, and kept clean.

21. Floors of shops and of water-closet apartments to be scrubbed weekly, swept daily, and kept free of refuse.

22. A separate water-closet apartment shall be provided for each sex, with solid partitions to extend from floor to ceiling, and with separate vestibules and doors.

23. Water-closets to be adequately flushed and kept clean.

24. A special caretaker to be designated by the employer to the care of the shop and water-closet apartments.

25. A sufficient number of water-supplied washbasins to be provided in convenient and light locations within the shop.

26. Suitable hangers should be provided for the street clothes of the employees, and separate dressing rooms to be provided wherever women are working.

27. Water-closet apartments, dressing rooms, wash rooms, and lunch rooms to be properly lighted, illuminated, ventilated, cleaned, and kept clean.

28. All seats to have backs.

After the passage of the laws of 1912, recommended by the New York State Factory Investigating Commission, appointed by Gov. Dix, the following new standards were added:

29. All waste materials, cuttings, and rubbish must be removed twice a day from the floor of the shop and once a day from the building.

30. In all shops where more than 25 persons are employed above the ground or first floor a fire drill of the occupants of such building shall be conducted at least once in every three months.

31. In every factory building over seven stories or over 90 feet in height in which wooden flooring or wooden trim is used and more than 200 people are regularly employed above the seventh floor or more than 90 feet above the ground level of such building, the owner of the building shall install an automatic sprinkler system approved as to form and manner in the city of New York by the fire commissioner of such city, and elsewhere by the State fire marshal. Such installation shall be made within one year after this section takes effect.

Sanitary certificates are issued by the joint board and are granted to shops that have complied with all the standards established by it. Up to September 1, 1912, 553 sanitary certificates have been granted, 620 shops containing over 60 per cent of the workers. After the fourth inspection, which is now being made, the number of certificates issued will be increased.

This certificate is good for six months, and is revokable for cause. Unfortunately, the sanitary certificate covers the shop but not the

garment. One of the difficult elements is the fact that large manufacturers sometimes employ subcontractors whose shops are below standard. There is lack of control of these garments made even by the large manufacturers.

Recently, upon demand of the joint board, the Manufacturers' Association agreed to compel the contractors employed by their members to put their shops into condition for the certificate, and a large number of these contractors have received them.

INVESTIGATION OF VENTILATION.

The board secured the services of Dr. C. T. Graham Rogers, chief medical inspector of the State bureau of labor, to make an intensive investigation of ventilation and air conditions in the suit and cloak factories. The results of this were published in the first annual report of the joint board.

Dr. Rogers states, as a result of this investigation, that it has been clearly determined that the atmospheric conditions found in a majority of shops are not conducive to good health and should be remedied. He traces much ill health among cloak makers to defective ventilation, to foul air, and to the stooping posture of the workers.

Unfortunately very little definite progress has been made, even by experts on ventilation, to give enlightened employers and labor leaders definite standards of ventilation and methods for securing it.

Investigation of the shops has disclosed little violation of the law providing for 250 cubic feet of space per person. This space is doubtless ridiculously inadequate. Overcrowded shops with very little free available space show upon measurement the necessary 250 cubic feet per person. With ceilings 10 feet high, that space allows but 25 square feet of floor space, and no deduction is made for space occupied by machinery, bulky material, stock, and so on.

Inspection of the shops has not greatly affected the ventilation, beyond the general sanitary conditions, which have been greatly improved. Dirty walls, ceilings, floors, and windows have been cleaned, more adequate provision made for the disposal of garbage, and separation of toilet accommodations for men and women has been secured.

PHYSICAL EXAMINATION OF WORKERS.

Recently the board has undertaken the physical examination of the workers, for the purpose of securing data on occupational diseases. Eight hundred workers volunteered and were examined, showing a high tuberculosis rate, as might have been expected; i. e., 16 to the 1,000. The other diseases are also much higher than the

average disease rates of the United States. Further special investigations will doubtless be made.

Morbidity statistics of the 800 cloakmakers examined by the joint board of sanitary control.

	Total.		Operators.		Pressers.		Finishers.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number	Per cent.
No diseases	298	37.3	129	16.1	20	2.5	149	18.6
One or more diseases	502	62.7	262	32.8	60	7.5	180	22.5
Total number examined	800	100.0	391	48.9	80	10.0	329	41.1
Nativity:								
Russian	379	47.4	170	21.3	21	2.6	188	23.5
Italian	186	23.2	105	13.1	3	.4	78	9.7
All others	235	29.4	116	14.5	56	7.0	63	7.9
Total	800	100.0	391	48.9	80	10.0	329	41.1
Number of years in trade:								
Under 1 year	10	1.2					10	1.2
1 year to 5 years	253	31.6	64	8.0	25	3.1	164	20.5
6 years to 10 years	190	23.8	98	12.3	20	2.5	72	9.0
11 years to 20 years	214	26.8	145	18.1	26	3.3	43	5.4
21 years and over	133	16.6	84	10.5	9	1.1	40	5.0
Total	800	100.0	391	48.9	80	10.0	329	41.1
Age groups:								
16 to 19	104	13.0	14	1.8			90	11.2
20 to 24	190	23.8	81	10.1	6	.8	103	12.9
25 to 34	250	31.3	163	20.4	29	3.6	58	7.3
35 to 44	158	19.7	92	11.5	30	3.7	36	4.5
45 and over	98	12.2	41	5.1	15	1.9	42	5.2
Total	800	100.0	391	48.9	80	10.0	329	41.1
DISEASES.								
General:								
Phthisis	13	1.6	9	1.1			4	.5
Rheumatism	45	5.6	28	3.5	6	.7	11	1.4
Anemia	173	21.7	102	12.8	15	1.9	56	7.0
Total	231	28.9	139	17.4	21	2.6	71	8.9
Nerves and special senses:								
Ear	7	.9	6	.7			1	.1
Eyes	51	6.4	29	3.6	12	1.5	10	1.2
Nose	35	4.4	23	2.9	6	.8	6	.8
Nerves (not specified)	18	2.2	10	1.3	2	.2	6	.8
Total	111	13.9	68	8.5	20	2.5	23	2.9
Circulatory:								
Heart	36	4.5	22	2.8	5	.6	9	1.1
Arteries	32	4.0	13	1.6	8	1.0	11	1.4
Varicose veins	1	.1	1	.1				
Total	69	8.6	36	4.5	13	1.6	20	2.5
Respiratory:								
Larynx	7	.9	5	.6	2	.2		
Bronchitis—								
Acute	25	3.1	17	2.1	3	.4	5	.6
Chronic	56	7.0	26	3.3	11	1.4	19	2.4
Asthma	16	2.0	7	.9	4	.5	5	.6
Pleurisy	6	.7	1	.1	1	.1	4	.5
Total	110	13.7	56	7.0	21	2.6	33	4.1
Digestive:								
Pharynx	106	13.2	76	9.5	12	1.5	18	2.2
Stomach	45	5.7	20	2.5	5	.6	20	2.5
Hernia	17	2.1	8	1.0	6	.8	3	.4
Total	168	21.0	104	13.0	23	2.9	41	5.1

Morbidity statistics of the 800 cloakmakers examined by the joint board of sanitary control—Continued.

	Total.		Operators.		Pressers.		Finishers.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Genito-urinary:								
Nephritis	3	.4	3	.4				
Cystitis								
Pelvic	79	9.9	3	.4			76	9.5
Total	82	10.3	6	.8			76	9.5
Skin:								
Contagious	1	.1	1	.1				
Noncontagious	10	1.3	6	.8			4	.5
Total	11	1.4	7	.9			4	.5
Locomotion:								
Bones	1	.1	1	.1				
Joints—								
Coronal suture	14	1.8					14	1.8
Knee	14	1.7					14	1.7
Total	29	3.6	1	.1			28	3.5
Miscellaneous:								
Syphilis	1	.1	1	.1				
Gonorrhea	1	.1	1	.1				
Total	2	.2	2	.2				
Total diseases	813		419		98		296	

At the close of the third sanitary inspection it was possible to make the following comparisons, the report of which was published in the bulletin of the board and widely read by members of the unions and by the employers:

The board then had a sanitary survey of 1,884 shops, compared with 1,738 in the second inspection, and 1,243 in the first.

The number of shops with no drop ladders had been reduced from 236 to 38, or from 13 to 2 per cent.

The doors opening in had been reduced from 97 per cent in the first inspection to 79 per cent in the second inspection, and to 48 per cent in the last.

The increase in the number of dressing rooms is indicated by the reduction from 79 per cent of shops with no dressing rooms in the first inspection to 58 per cent in the second and 34 per cent in the third.

And progress in protecting the worker from eyestrain is shown in the fact that the shops unprotected from glare have been reduced from 83 per cent in the first inspection to 72 per cent in the second and 51 per cent in the third.

The development of the industry into the high-loft buildings has brought about serious problems of fire protection. Fifty-five per cent of all the workers in the trade are employed at the height of the sixth story and above.

In the inspection made in February, 1912, 27,813 employees were working above the sixth floor. Many of the buildings, though of fireproof material, are veritable deathtraps, as was unfortunately demonstrated in the Asch Building, when 143 girls lost their lives.

No fundamental solution of the fire danger is possible without reducing the height of factory buildings. Under these circumstances the board of sanitary control can only record success in insisting upon adequate fire escapes, the installation of drop ladders in their proper places, the posting of fire notices, the encouragement of the organization of fire drills, and the creation of intelligent study by those most concerned, namely, the workers themselves.

The existence of a body of people intelligently concerned in establishing and in maintaining modern factory sanitation is of importance to the entire community. The joint board of sanitary control is a novel experiment in democratic regulation of the conditions of a large industry. Responsibility for the work of the board is not confined to the employers only, nor to the workers, but is shared by both in cooperation with the representatives of the public who are, as consumers, hardly less responsible than the others, and who must reflect the progress of a community. The public can not be indifferent to the condition of the workers, and should share with employers the responsibility for the maintenance of better conditions. Probably some extension of the use of a label will be advised, under the authority of the joint board, indicating to consumers the compliance of the employers and the trades unions with an intelligent demand for decent working conditions.

The Consumers' League was a pioneer in promoting this idea in America. The underlying principle will not be different, if the joint board bestows a label which will be able to give the further security of an assurance of the trades unions' approval of labor and wage. The strength of the enforcement of the standards established by the joint board of sanitary control lies to a great extent in its democracy.

INDUSTRIAL INSURANCE THE BASIS OF INDUSTRIAL HYGIENE.

LEE K. FRANKEL,
Sixth vice president, Metropolitan Life Insurance Co., New York City.

Notwithstanding the remarkable development of life insurance in the United States during the last 50 years, a development even greater than in European countries, comparatively little attention has been given to the insurance of individuals against other risks attending life, particularly those of sickness, accident, invalidity, and old age. On the other hand, along with the growth of life insurance there has been a corresponding growth of insurance against the hazards to which property, merchandise, and material things generally are subject.

The reasons for this are not difficult to seek. Human life has, until quite recently, been held cheap. Property has had its distinct value in all ages. Cattle and live stock have had greater worth than wife and children, unless the latter had a distinct wage-earning capacity. Zola's wonderful description of the peasant whose wife and cow were to be delivered at the same time, and who, having funds for only one doctor, sent for the veterinarian, is typical of the earlier viewpoint. Similarly the decline in the English birth rate, following legislation forbidding child labor, indicates the unwillingness to have children whose earning ability must be deferred until they are fairly mature. There is, of course, another side to this picture, and a dark one at that, namely, the apparent inability on the part of many workmen to earn, through their own effort, sufficient to maintain their families.

Primarily, however, the lack of development of insurance against sickness, accident, or invalidity must be laid to the door of the general belief in the inevitability of death and its progenitors. The fatalism of the East Indian, that "what must be will be," applied to all the incidents of life. Death was a calamity, not necessarily to be dreaded, but one which could not be set aside, and which was to be borne with submission or stoicism. Conflagration, plague, sickness, disaster at sea, were all manifestations of a mysterious Providence whose acts could not be gainsaid or thwarted.

It is easy to realize, with this conception in mind, that the original purpose of insurance was to offset losses. The earnings of the dead father were replaced as far as possible by the interest earnings of the insurance money paid at his death. Insurance money could rebuild the house or mill destroyed by fire, replace the vessel lost at sea, pay the physician, or buy another cow in place of the one struck by the train. Indemnity for losses which, in the last analysis, had a money value, was the underlying concept of insurance. Fundamentally, the purpose of insurance was to cover or reimburse individuals for losses suffered through risks and hazards constantly confronting humankind. The reason for insurance was based on the inevitability of loss due to common hazards and the inability of individuals to bear their losses alone. Only by the distribution of these risks and hazards from the shoulders of the one to the backs of the many could the losses be met without great suffering to the individuals concerned.

The illuminating thought that all risks and hazards of life are not inevitable is of comparatively recent origin. Its earliest development, as might have been anticipated, was in the field of property and chattel insurance. As the realization grew that conflagrations were avoidable, and that many of them were due to carelessness and incompetency, a premium was soon put on devices and installa-

tions intended either to minimize the results of fires or to prevent their occurrence. Less stress was eventually laid upon the fire engine than upon sprinkler devices and the proper storage and care of combustible substances. In certain mutual fire insurance associations in the United States, whose members must comply with definite rules and regulations prescribed by the associations, the number of fires per annum and the losses incurred have been materially reduced.

The development of similar preventive measures in the field of insurance against sickness, accident, and invalidity has been much more recent. Insurance against these hazards is not new. In fact, there are indications of insurance schemes to cover these contingencies even in Roman times. The guilds of the Middle Ages included, in their schemes of benefit, insurance protection against sickness, and accident. The Friendly Society movement in England, the Mutualités of France and Belgium, and the Krankenkassen of Germany and Austria, are expressions of similar intent to safeguard the members of these associations against the hazards of life. In all of these, however, the original concept included only indemnity for losses suffered.

The United States, of all countries, has probably been the most backward in developing plans for insurance against sickness and its resultants. The fraternal orders, which originally were comparable with the English friendly societies, have largely departed from their primary purposes and have become life insurance associations, and only incidentally fulfill the mutual benefit function of offering protection to their members in the other hazards of life.

We must look to Germany for the first thorough development of the preventive principle in insurance against sickness, accident, and invalidity. Admitting this, it must at the same time be conceded that the results which have been accomplished are due to the social insurance scheme which has been intensively organized since the early eighties. Beginning with accident insurance, there followed, in short order, insurance against sickness, invalidity, and old age. More recently, the scheme has become even more comprehensive by including a very practical and beneficial form of life insurance, namely, pensions for widows and orphans. It is not unlikely that, from time to time, opportunity to insure will be accorded other strata of the population. In fact, a new law, effective January 1, 1913, extends the principle of compulsory insurance to clerks and others in similar occupations.

Under the German scheme, employers were required to insure their employees against the consequence of industrial accidents and to organize themselves in mutual trade associations similar to the mutual fire associations, so well known in Massachusetts. The employers who, prior to 1880, had been unorganized, and in the keenest

competition with one another, were brought together on a basis of common interest in the Berufsgenossenschaften or trade associations. Self-interest soon dictated a policy of self-preservation. It was realized by the manufacturer or mill owner that if the premiums which were charged him by the mutual trade association under the law were higher than he had anticipated from his own experience with his workmen, this was due to a disregard of the essential principles of safety and carefulness on the part of other employers in the same class with him. This naturally led to the promulgation of rules and regulations by the Berufsgenossenschaften requiring members to install sufficient safety devices in their respective industries to minimize the percentage of accidents. Since the societies were empowered to collect higher premiums from those who failed to subscribe and to conform to these rules and regulations, the employer found it to his advantage to use every possible means to safeguard the welfare of his workmen.

Eventually, when certain industrial diseases were classified as coming under the provisions of the accident law, the employer found it of financial benefit to equip his establishment so that such diseases would not occur. We need only mention the elimination of white phosphorus in the manufacture of matches, and the manufacture of paints from oxides other than lead. It was an obvious sequence of such provisions that factories and other industrial establishments should be put in the best possible sanitary condition, particularly in order to avoid the presence of dust, impure air, insufficient lighting, and so forth, since it was recognized that these conditions led to impaired health of workmen. Hours of labor were reduced, not merely because of the demands of the workmen through their trade unions, but because the employer realized that overstrain in industry was a responsible factor in bringing about accident and disease. It can not be said that these and other concessions on the part of the employer were due to any sentimentalism. It was "business," pure and simple. The employer introduced safety devices, put his factory in the best sanitary condition, and developed a factory hygiene, because it paid him to do so; because in time the lack of these means greater inefficiency, more expense, and the inability to compete with his more enlightened competitors. The wonderful industrial development in Germany in the last 25 years can unquestionably be attributed, in large measure, to the social-insurance scheme which prevails there, and which has taught the employer, as well as the employee, the utility of work under conditions which maintain health and prevent useless and avoidable injury and disease.

A development similar to the above has taken place more recently in connection with the sickness-insurance scheme. The reason for this later development is readily seen. The sickness-insurance associ-

ations, until within recent years, have been organizations with limited membership, the workmen themselves having the larger representation in the boards of control. It was impossible for sickness societies with several hundred members to institute measures of prevention in the hope of reducing the amount of sickness. It is questionable, in fact, whether in the earlier years these societies, owing to their peculiar structure, realized the possibility within themselves for improving the health of their members. Workmen, even when organized, have as yet not had the financial stimulus for a comprehensive scheme of social engineering.

This has largely been the opportunity of the employer. Nevertheless, even with the disjointed scheme of sickness insurance, which was enacted in the original legislation as a compromise to meet an existing situation, it soon became apparent that the province of the sickness societies was to prevent sickness as well as to pay benefits to their members when incapacitated by disease. To-day, the tendency in Germany is to consolidate a number of small sickness societies into one large society, and thus, by centralization of management, to inaugurate proper preventive measures. In cities like Leipzig, Dresden, Berlin, and others, where such consolidation has already taken place, the sickness societies strain every effort to educate their members in hygiene and sanitation. Many of these societies have sanatoria, convalescent homes, fresh-air homes, Zander institutes, and dental clinics for the use of their members, and by the distribution of literature, and in other ways, the members are educated regarding the prevention and cure of tuberculosis, the results and danger of sexual disease, and the evils of alcoholism.

Even more pronounced are the efforts of the officials who administer the invalidity-insurance scheme. It may in truth be said that the sickness insurance societies have followed in the wake of the invalidity-insurance departments in organizing a social therapy. It can not be too often repeated that in invalidity and sickness insurance, as in accident insurance, sentiment has played but a small part. This is written, not as a reflection upon the insurance scheme, but rather in a spirit of commendation. The invalidity departments throughout the empire have built their chain of hospitals, sanatoria, and so forth, have loaned their millions of marks to erect workmen's dwellings, and are insistent that the invalid workman receive the best possible medical treatment in the early stages of his sickness, because it has been proven by experience that, in the long run, it is more economical to prevent disease or to cure it, than to pay pensions over a period of years to victims of chronic invalidism or permanent disability.

Have the results justified the soundness of the conviction embodied in the German law? This paper is being written, as it were, on the

spot, after an intensive study of the things that have been accomplished. More and more is the writer of the opinion that the views which he has expressed in other places as to the soundness of the principles underlying the German insurance scheme are correct. It seems clear, from recently gathered statistics in the invalidity department, particularly that of Berlin, that the number of new invalidity pensioners is annually growing smaller, while the number of old-age pensioners is growing larger; or, in other words, that fewer individuals are permanently incapacitated by illness, while more of them are reaching the seventieth year than heretofore. Notwithstanding the recent diatribe of Friedensburg on the accident-insurance law, it can not be denied that, in proportion to the number of the insured, there has not been a marked increase in the number of accidents, while in the number of injuries producing permanent incapacity there has been a decided diminution.

Practically the same is true in the field of sickness insurance. It does not appear that there has been any increase in the amount of sickness, but rather the contrary. It must be remembered that, today, the German workman is fully cognizant of his rights under the law, that no effort is made to bar him from receiving his legitimate benefits, but rather the reverse; in fact, distinct propaganda is made to encourage the insured to avail themselves of the benefits of the insurance at the earliest moment after illness sets in, in the hope that working efficiency may be quickly restored and chronic or continued illness prevented. It must be further remembered that the very rapid development of industry in less than three decades should have had the tendency to increase occupational disease and accidents, particularly since many of the communities in which factories and mills have grown like mushrooms were formerly agricultural in character.

The moral is obvious. It is quite evident that the German insurance legislation has been effective in producing a comprehensive industrial hygiene, which, while still in its infancy, gives assurance of continued improvement and growth. It is equally evident, on the other hand, that drastic general legislation superimposed upon a people or community is honored more in the breach than in the observance, and that attempts to inculcate principles of hygiene and sanitation on a semiphilanthropic basis are repugnant to self-respecting and intelligent workmen. It is not the compulsory principle in the German insurance scheme that has made it effective, but rather the insurance principle itself. It could probably be demonstrated that a voluntary insurance scheme could be made equally effective. Many of the private accident insurance companies have issued instructions to their policyholders for the prevention and minimization of accidents. Stock and mutual fire insurance companies, as stated above, have for years valued sprinkling devices, and steel and stone

construction, above fire engines. The large life insurance companies more recently have engaged in a campaign for the extension of human life. Free examination of policyholders is offered; circulars of instruction and information are issued. With particular respect to workingmen, the experiment of the Metropolitan Life Insurance Co., of New York, is proving that it is possible to educate millions of working men, women, and children in the principles of industrial and domestic hygiene. Both the literature on health topics which the company has distributed, and the visiting nurses whom it is sending into the homes of its policyholders, have, as their primary object, the education of policyholders in the fundamentals of good health and right living. The details of this experiment will be found in the special pamphlets which the company has had prepared for this Congress. Incidentally, the cooperation of policyholders has been secured, not through force, or pressure, or compulsion, but voluntarily, in the knowledge, on the part of policyholders, that the experiment is a concrete expression of their concerted views, to which, as individuals, they would be unable to give expression.

In its last analysis, insurance is an intensified form of cooperation. It is the union of masses of men to bear a common burden. Whether this union, in its origin, is compulsory or voluntary, is of secondary importance. The German results show that, even under a compulsory plan, which requires personal contributions from employer and employee, both have a personal interest in any development which affects their immediate welfare. That there is an even greater personal interest in voluntary organizations has been amply demonstrated by the Friendly Society movement, under one name or another, in its manifestations in various countries.

Our need in the United States is the cultivation of the principle of prevention as applied to sickness and invalidity, similar to the beginnings which have been made in insurance against fire and accident. Before this can be done, however, we must have a comprehensive scheme of insurance against the consequences of sickness and invalidity. The development of this form of insurance in the United States is as yet fragmentary and insubstantial. Its further and more complete growth should be a matter of the immediate future.

DISCUSSION.

Dr. I. M. Rubinow, chief statistician of the Ocean Accident & Guarantee Corporation, New York. There are just a few points I should like to call attention to in the interesting paper of Dr. Frankel. The first is the title of the paper, which, I believe, is unfortunate. It has been explained that under this term the author understands the entire sum total of insurance institutions which is coming

to be designated in Europe more and more universally as "social insurance," rather than the particular form of life insurance of workingmen by commercial insurance companies which is known in this country under the name of "industrial insurance." It is true there has been an effort by Prof. Henderson, of Chicago, to give the term "industrial insurance" this broader interpretation, but this proposal had had very little support. At this stage of the development of the principles of social insurance, when both the principles and the term itself are rapidly growing in popularity in this country, and since the term "industrial insurance" has the well-defined meaning to perhaps 20,000,000 holders of these industrial policies, and especially in view of the radical differences between the two forms of insurance in form, in organization, and in purpose there is nothing to be gained, and a good deal of accuracy and precision to be lost by this confusion of terms.

However, this may, after all, be considered a minor matter. More important is what is, in my opinion, an overemphasis of the insurance basis of industrial hygiene, especially as applied to private voluntary insurance. It is undoubtedly true that a good many effective measures of hygiene may owe their origin to the desire to reduce the cost of insurance. And it is possible to imagine that an insurance institution may encourage such measures of hygiene with a view of decreasing its losses. Nevertheless, the desire to reduce insurance losses or save on insurance premiums ought never to be the basis of industrial hygiene. Human life is too precious to be measured in terms of profit or loss to an insurance institution. A more fundamental basis of industrial hygiene must therefore be found. It is easy to imagine that if a man who carries a $10,000 life insurance policy is stricken down with an attack of appendicitis, and lacks the necessary funds for treatment, it may pay the insurance company to advance that person $500 for the cost of an operation. But I, for one, would not want to be in a situation where my chance of life and death depended upon the judgment of an insurance company as to its opportunity for profit or loss.

It is true that the same criticism may be offered of other views expressed at the meetings of this section. There has been a marked tendency to have the appeal for industrial hygiene and for accident prevention based upon the ground of increased efficiency or saving of costs to the employer. Of course, there is no objection to soliciting the employer's cooperation on that ground, but surely the true basis of industrial hygiene is the accrued benefit to the employee and not to the employer. The danger lies just here, that as soon as you emphasize the question of cost and savings, you must face the problem of comparative costs, when you reach the point where additional prophylaxis may be bought only at a loss to the employer. Can

any scientific theory of industrial hygiene stop at that point, and go no further? The same holds true of the connection between insurance and hygiene. There is a close connection between the two in Germany and other countries, to be sure. But it is mutual cooperation, and not subservience of hygiene to insurance interests. If the German sickness and invalidity insurance institutions do a good deal of prophylactic work, the saving of insurance costs may be an additional argument in its favor, but it is not its basis. Both are equally important expressions of the spirit of social cooperation, and the only true basis is the welfare of the classes concerned.

Finally, I am somewhat inclined to disagree with the assertion that whatever is possible to compulsory insurance is possible also to voluntary insurance. That is a problem which has been quite satisfactorily considered and settled in European theory and practice. Perhaps this statement is a result of the confusion of terms which I have mentioned. There are three essential points which distinguish social insurance from private and voluntary insurance. Private insurance is a legitimate business, conducted for profit like any other business, while the element of profit does not exist in social insurance. Private insurance is conducted inevitably with a high cost of administration, while in social insurance the effort is to reduce this cost to a minimum. And, finally, in private insurance the entire cost must be met by the insured, while all social insurance is based upon recognition that the insured is unable to meet all of this cost, and part of it is shifted upon other shoulders, either upon the employer or upon society at large.

Keeping these distinctions in mind, it is quite evident that neither intensively nor extensively can the results of voluntary insurance approach those of compulsory insurance. And if that be true of insurance itself, it must necessarily be equally true of the prophylactic activity of insurance institutions. As a matter of fact, there is a tendency to too greatly overvalue these prophylactic results. Perhaps in no line of private insurance are these prophylactic measures so much in evidence as in fire insurance. Nevertheless, our fire loss in this country is still enormous and is still increasing.

To sum up, the value of insurance is enormous, quite independently of prophylaxis. On the other hand, there can be no more important basis for industrial hygiene than the health and happiness of the industrial population. It seems to me that its social importance is lowered by over-emphasizing considerations of financial gain or loss, whether to the employer or to the insurance company.

THURSDAY AFTERNOON, SEPTEMBER 26, 1912.

THE HYGIENE OF OCCUPATION AND ITS ADMINISTRATIVE CONTROL.

Dr. Wm. C. Hanson, assistant to the Secretary, Massachusetts State Board of Health, Boston.

For the proper study of the effect of occupation on health each State must have an adequate body of field workers, whose work must be intelligently supervised by some competent authority. Prominent among the field workers must necessarily be well-trained physicians. The supervising authority should, in the interest of the entire community, be the central health authority of the State—the State board of health. That such a system is logical and practical has been amply shown by the work of the Massachusetts State Board of Health during the last eight years.

The hygiene of occupation conducted within industrial establishments is an important part, but only a part, of the hygiene of the community. Moreover, with the exception of those occupations which are intrinsically dangerous to health by reason of the nature of the materials involved, intelligent conclusions as to the effect of work conducted in the industrial establishments can not be reached without some knowledge of the home and community life of the worker.

Occupations outside of industrial establishments are in many instances as productive of injury and disease as are those conducted within the walls of a factory. Overcrowded localities, including overcrowded, unventilated, dirty, and insanitary homes, immorality, intemperance, high birth rate, ignorance, and improper and insufficient food furnish all the conditions that favor a high mortality. It is, therefore, not an easy matter to determine correctly the amount of influence properly chargeable to a given occupation.

Such work as the State inspectors of health of Massachusetts have accomplished in the industrial establishments of the Commonwealth emphasizes the need of furthering the study of occupational hygiene throughout the country on such a scientific basis as that now well established by the Massachusetts State Board of Health, and of including in the investigation of the prevalence of communicable diseases and dangerous influences within the factory inquiries concern-

ing the health of adults as well as minors. In this work the position of the State inspectors of health of Massachusetts is unique, so far as America is concerned. These officials are constantly in touch with the prevalence of diseases in their respective health districts, and, further, with practicing physicians whose assistance they frequently get, not only concerning communicable but occupational diseases.

It has thus remained for the State of Massachusetts, the State which established the first State board of health in this country, to lead all other States in the recognition of the fact that the inspection of industrial establishments by well-trained medical men under the supervision of a board whose duty it is to study the health of the community in its broadest sense—the State board of health—means the promotion of public health.

THE PREVENTION OF OCCUPATIONAL DISEASES.

Dr. H. LINENTHAL, State inspector of health, Boston.

The term "occupational diseases" is not a well-defined one. Broadly speaking, morbid conditions resulting from occupations can be divided into two general groups:

1. Morbid states resulting from certain industrial processes giving rise to specific diseases, such, for instance, as lead, mercury, arsenic, and phosphorous poisoning among workers in industries where these chemicals or their compounds are used. In this group of cases the causal connection between the chemical used and the morbid changes in the body tissues of the worker is clear and unmistakable.

2. Morbid states resulting from insanitary conditions under which workers are employed. Such conditions need not give rise to specific diseases, but may so reduce the resisting power of the individual as to make him fall an easy prey to any contagion with which he may happen to come in contact. The general debility or tuberculosis in a person employed in a sweat shop, for instance, where the sanitary conditions are bad, where for 10 hours or more of the working day he is shut up in an unclean, poorly lighted, badly ventilated room, would be a case in this group. Unlike the first group, the industrial conditions here act as predisposing causes rather than the immediate causes of the disease.

The clear definition as to what constitutes occupational diseases can, however, only come in question in connection with workmen's compensation acts where the workman is entitled to indemnity for diseases arising from his work. From the standpoint of preventive medicine, a clear definition as to what diseases should be called occupational diseases is not essential. Preventive medicine concerns itself

equally with the ill effects upon the health of workers, whether these effects result from certain industrial poisons or from certain entirely avoidable insanitary conditions. In fact, from the standpoint of the conservation of the health of the worker, the alleviation of the conditions which do not cause specific diseases, but which have as their inevitable consequence the diminished bodily resistance with greatly increased susceptibility to diseases of all kinds, is of even greater importance than the dealing with the causes of specific industrial diseases. More important, because it affects greater numbers. The number of workers employed in trades recognized as dangerous is but a small fraction of the vast number who are employed in the enormous variety of industries which in themselves are not injurious to health, but which undermine the health of the operatives by the entirely avoidable insanitary conditions under which they work.

Considering the vast importance of the effect of industrial processes and labor conditions upon the health of operatives, the paucity of statistical data on the subject is extremely deplorable. There are a great number of industries in Massachusetts, for instance, in which the workers are exposed to lead and its compounds, yet we have no means of knowing the actual number of cases of lead poisoning that occur annually in the State. The same is true of all the other organic and inorganic poisons that are used, more or less extensively, in our industries. Our knowledge is still less as to the effect on the morbidity and mortality of the industrial community from insanitary conditions, the effects of which are more remote than are those of industrial poisons. There is no available data on the subject.

The causes for our lack of data are obvious. With few recent exceptions physicians are not required to report any cases of occupational diseases to any central health authority, and no knowledge is therefore available as to the number of those cases that occur. Moreover, the death certificates give only the immediate cause of death, with no indication as to the primary cause. A lead worker, for instance, may die from cerebral hemorrhage resulting from the arteriosclerosis of chronic lead poisoning. The cause of death will be given as cerebral hemorrhage. Nothing will appear on the death certificate to indicate the fundamental trouble—chronic lead poisoning. Furthermore, not sufficient attention is given in our morbidity and mortality reports to the occupation of the individual at the time the disease was contracted. The little data which is available is often misleading. A worker in a dust trade may begin to feel the ill effects of the dust-laden air to which he is exposed, and may take up some other form of work. Shortly after, a definite diagnosis of tuberculosis may be made, the occupation on the records being the one he is engaged in at the time the diagnosis is made, one which could not possibly

be responsible for the tubercular condition. No mention is made as to his previous occupation where the disease originated. Moreover, not sufficient attention is given in medical schools to the effect of occupation on health. In taking histories of cases, the student is trained to inquire into the life habits of the patient, as to the use of tea, coffee, alcohol, tobacco, and so forth. To be sure, these are all very important, but not nearly so important, particularly among wage earners, as is the nature of the work in which the patient is engaged, and the conditions under which he works. It is true that the student is taught to inquire as to the occupation of the patient, but this is recorded in such a general way as to be of little value either in the diagnosis of the particular case in question or in the collection of data from which inferences might be drawn as to the relation of certain occupations to health.

Such general designation as "laborer," "mill operator," "metal worker," etc., is of no value in indicating the work done; even specific statements—"worker in rubber factory," "shoe factory," and the like—do not mean much, since there are a variety of processes in these industries, some of which are of greater significance from the standpoint of the health of the employees than others.

While, of course, it can not be expected that the physician should be acquainted with the infinite complexity of industrial processes, it seems that it would be of great value for him to have a general knowledge of the so-called dangerous trades, and of the particular dangers to the health of the operatives that lurk in some of the processes. The comparatively small amount of time that would be required on the part of the medical student, say, in his fourth year, to acquire this knowledge, would be fully compensated by his greater efficiency in handling his cases in hospital clinics or in private practice.

While it is generally recognized that certain industrial processes are injurious to health and that insanitary conditions in workshops and factories are prejudicial to the well-being of operatives, very little has been done to make systematic investigations into industrial conditions. To the Massachusetts legislatures of 1904–1906 belongs the credit of having taken the first step in this country to obtain definite scientific data on the subject by their authorizing the State Board of Health to make an investigation into the sanitary conditions of factories, workshops, and mercantile establishments. This work was carried on under the able direction of the late Dr. Charles Harrington, and his report to the legislature of 1907 is the first document in this country to deal in a systematic manner with the effects upon the health of operatives in the various industries in Massachusetts.

Following the report of Dr. Harrington, the legislature of 1907 enacted a law whereby the State was divided into health districts,

and a physician was appointed in each district as State inspector of health. The original number of districts was 15, but it has since been changed to 14. Under the law, each State inspector of health is required to inform himself respecting the sanitary condition of his district and concerning all influences dangerous to public health or threatening to affect the same; he is to gather all information possible concerning the prevalence of tuberculosis and other diseases dangerous to the public health within his district; he shall disseminate knowledge as to the best methods of preventing the spread of such diseases, and shall take such steps as, after consultation with the State board of health and the local health authorities, shall be deemed advisable for their eradication; he shall inform himself concerning the health of all minors employed in factories within his district, and whenever he may deem it advisable or necessary he shall call the ill health or physical unfitness of any minor to the attention of his or her parents or employers and of the State Board of Health.

Besides these general duties and advisory powers to the local boards of health the State inspectors of health were given the enforcement of all laws relating to the health of persons employed in industrial establishments. Massachusetts was thus the first State in the Union to recognize that factory inspection is essentially a matter of public health and should be under the charge of the central health authority of the State.

Perhaps one reason for the scarcity of our knowledge of industrial conditions and of their effects upon health is that all industrial inspection is, as a rule, done by persons entirely unfamiliar with sanitary matters. Such inspection must necessarily become a mere matter of routine carried on in a perfunctory manner and little calculated to bring about effective changes or to increase our knowledge of the effects of industry on health. To quote Dr. William C. Hanson, assistant to the secretary of the State Board of Health, who is directing the work of the State inspectors of health:

> Medical men alone are in a position to make the best use of facts obtained concerning the sanitary conditions of the premises where men and women work; to study the possible injurious effects of certain processes upon the health of the person engaged therein; to inspect devices designed to protect the employees against injurious and dangerous substances, as well as to detect pathological signs or symptoms of certain poisons and dust and fumes incident to some occupations; to inquire as to the health of the employees; to make physical examination of minors and, whenever possible, of adults engaged in trades deemed to be injurious to health; and to collect and make proper use of all facts and data, including morbidity and mortality statistics pertaining to occupational hygiene.

The work of the State inspectors of health of Massachusetts for the last five years under the direction of Dr. Hanson has already resulted in the accumulation of a vast amount of material on indus-

trial hygiene and on factory sanitation. Thoroughly taken up with his work Dr. Hanson has succeeded in imparting his enthusiasm in this comparatively new field of preventive medicine to the men whose work he directs. Not only have vast changes been brought about in the industrial establishments of the State, but extensive investigations have been made of a great variety of industries and processes in which workers are exposed to influences dangerous to health. Special investigations have thus been made of a number of trades in which workers are exposed to dusts, to irritating and poisonous fumes, to extreme degrees of temperature and humidity, and to general unsanitary working conditions. The industries thus studied include the textile industry, the pearl industry, felt-hat industry, mattress and curled-hair industry, the boot and shoe industry, the rubber industry, the making of jewelry, metal polishing and buffing, a group of industries in which workers are exposed to lead poisoning—such as printing, stereotyping, monotyping and linotyping, electrotyping, paint manufacturing, potteries and manufacturing of tile—foundries, laundries, cigar factories, candy factories, and the clothing industry.

A vast amount of valuable data on industrial hygiene has thus been accumulated by the State inspectors of health and our knowledge of industrial processes and conditions is increasing. This is the first essential step in prevention. We must learn where the danger lurks before we can take any steps to check its ill effects. But there are other measures which would be effective in reducing the baneful effects of many of our present industrial conditions, some of which, although eminently practical, we have not yet put in operation. The following may be indicated among the preventive measures:

Occupational diseases, as many of them as practicable, should be put on the list of reportable diseases. The central health authority would thus quickly learn of any case that might occur. The establishment in which such a case occurred would be visited, and proper steps could be taken to prevent the occurrence of other cases.

The employees in certain occupations in which they are exposed to poisonous dusts and fumes should be examined periodically, so that symptoms of poisoning may be early detected. Young persons who, on account of their age, are more susceptible to dangerous influences should be excluded from certain occupations. Women likewise should be excluded from certain trades. Massachusetts is thus far the only State in the Union to prohibit the employment of minors in trades and processes designated by the State Board of Health as injurious to health. This legislation, of inestimable value in protecting the health of young persons, was the direct result of the observations of the State inspectors of health and of their reports thereon to the State Board of Health.

During the last year, for instance, 143 minors were found engaged in processes which had been declared by the Massachusetts State Board of Health to be injurious to health. They were exposed to lead and plumbago dusts in printing and electrotyping establishments, to pearl-shell dust, to talc dust in rubber works, to the fumes of naphtha in the shoe industry, and to the fumes of dipping metals in acid solutions. In every instance immediate steps were taken to safeguard the health of the minors thus exposed. They were either excluded from the factory, transferred to another department, or, what was most frequently the case, the employer adopted special means and devices which appeared to the State inspector of health to be efficient in protecting the minors against the dangerous influences.

Adequate legislation regulating sanitary conditions in industrial establishments, prescribing protective appliances for those exposed to dust, to irritating gases and fumes, and to industrial poisons, and the intelligent enforcement of these laws, are of course indispensable in order to maintain conditions compatible with safety to the health of the workers.

But of still greater fundamental importance than any of the above-mentioned measures is the education of both employers and employees. This becomes evident when numbers of industrial establishments are visited. A few examples will suffice:

In many metal-polishing establishments, where the workers are exposed to metallic and emery dusts, and also to cotton dusts from the buffing wheels, employers maintained that dust-removal systems are unnecessary; that the dust "is not injurious to health." On the other hand, the employees themselves often showed lack of appreciation of the dangers to which they were exposed and frequently removed the hoods from properly guarded machines on the pretext that these interfered with the work.

In visiting rubber factories the foremen, managers, and superintendents were questioned as to the occurrence of cases of lead poisoning among their workers. No record of cases was obtained. Most of them were unaware that there was any danger of lead poisoning and did not know that such cases ever occurred among rubber workers. And yet cases of lead poisoning are not uncommon in that industry. Of a series of 162 cases of lead poisoning treated in the out-patient department in one of our large hospitals over 11 per cent were among rubber workers and undoubtedly came from the same factories that were investigated. This discrepancy between the hospital records and the information obtained at the factories can be explained by the fact that the working population in rubber factories is shifting. Many workers are taken sick and drop out

without anyone in the factory knowing anything about them. Inasmuch as a great proportion of the rubber workers are foreigners — Poles, Italians, and so on—the patients themselves may not understand fully the nature of the trouble for which they are treated.

In several color-grinding establishments where lead salts were used no precautions were taken by any of the workers against the lead dust. In one establishment respirators were provided for the men who were exposed to the dusts, but these were not used. In another a man was observed using white lead in the mixing of paint. An open box of the powder was near him, from which he took a scoopful from time to time and threw it into the mixer, where it formed a paste with linseed oil. When all the powder was out of the box he turned it upside down and struck it over the mixer, producing a cloud of fine lead dust which enveloped him. The man stated that he took no precautions of any sort, and that while he had been at this work for 20 years he had been sick only once, suffering, as the doctors told him, from lead poisoning. While talking he took out a plug of tobacco from his pocket and carried it to his mouth, his hands being covered with lead. He was pale and emaciated, and, although only 45 years of age, he had marked arteriosclerosis.

One of the most dangerous processes observed was the sand blasting of iron castings. This consists of playing a stream of fine, dry sand by means of compressed air upon the casting to smooth the surface. During this operation, the worker is completely enveloped by clouds of fine, dry sand. It was stated that the length of time a man can keep at this work is not more than about a year, when he begins to show the effects of it and has to leave, only to be replaced by a new recruit. In one foundry visited, a special helmet, with a tube whereby the worker is supplied with fresh air, was provided for this work, but the man engaged in the process did not use it, "as it was too much bother to put it on and take it off."

Intelligent cooperation with the health authorities, on the part of the employers and employees, is absolutely essential. The employer must learn to realize that the provision of good sanitary conditions is an asset and increases the efficiency of his workers. He should therefore comply with the spirit as well as with the letter of the law, and, by a strict workroom discipline, see that the workers properly use protective devices. The workman, on the other hand, should not only recognize the dangers to health to which he is exposed at his work, but must learn to utilize to the fullest extent the measures which the law requires for his protection.

The central health authority of the community should be authorized to draw up special regulations for industries in which workers are exposed to poisonous dusts or fumes, with instructions, applicable in each particular industry, as to the measures necessary to avoid

poisoning. Such regulations and instructions should be posted in the workrooms where the particular processes in question are carried on.

To summarize briefly: For the prevention of the ill effects upon health from industrial processes or conditions, the following measures should be adopted:

1. To collect complete and accurate data about industrial processes and about conditions under which the various industries are carried on.

2. To obtain more accurate and detailed information relative to occupation on morbidity and mortality records.

3. To instruct the medical student in this important field of preventive medicine by a course of lectures on the more important industrial processes and the diseases to which they give rise.

4. To place the specific industrial diseases on the list of diseases notifiable to the central health authority.

5. To examine periodically all workers in certain industries. These industries should be named by the central health authority.

6. To exclude minors and women from certain industries which are designated by the central health authority as injurious to health.

7. To have adequate laws regulating sanitary conditions and protective devices in industrial establishments, and to have such laws intelligently enforced.

8. To have the central health authority issue regulations for certain dangerous trades, with instructions to employers and employees, showing them how they may guard themselves against the ill effects of their work, and to have such instructions posted in the workrooms.

9. To carry on an extensive educational campaign, both among employers and employees, as to the value of protective measures and good sanitary conditions.

UEBER JAPANISCHES FABRIKGESETZ.

Medicinalrat Dr. med. TADAHIRO NODA, Tokyo, Japan.

Verschiedene Industrien in Japan haben eine sehr schnelle Entwickelung durchgemacht. Die Anzahl der Werkstätten mit über 5 Arbeitern betrug bei der Zählung am Ende des letzten Jahrhunderts kaum 20.000 die der Arbeiter 450,000 während im Jahre 1909 bereits 32,228 Werkstätten und 800,637 Arbeiter gezählt wurden.

Was die Geschlechter anbetrifft, so ist das Verhältniss zwischen den männlichen und den weiblichen Arbeitern gerade umgekehrt im Vergleich mit anderen civilisierten Ländern; es beruht dies auf der jüngeren Entwickelung der auf männliche Arbeitskräfte angewiesenen Industrien, indem zur Zeit auf Arbeiterinnen ca. 62 Prozent und auf Arbeiter ca. 38 Prozent der Fabrikangestellten gerechnet werden;

daraus kann geschlossen werden, dass das neue Gesetz wenigstens von der hygienischen Seite im Interesse der in physischer Beziehung den männlichen Angestellten nachstehenden Arbeiterinnen ausgearbeitet worden ist.

Da aber früher eine schöne, vom Altertum ererbte Sitte überall bei uns herrschte, nach welcher die Beziehungen zwischen den Unternehmern und den Arbeitern sehr innige, geradezu familiäre waren, d. h., die Unternehmer ihre Arbeiter liebten, ihnen nicht zu starke Anstrengungen zumuteten, und wiederum die Angestellten auch gehorsam und vergnügt arbeiteten, so konnten merkbare Gesundheitsschädigungen der Arbeiter nicht nachgewiesen werden. Erst seitdem sich die grösseren Industrien rasch vermehrt haben, und wie z. B. in der Textilindustrie in einer Werkstatt mehrere Hunderte oder sogar mehrere Tausende von Menschen arbeiten, wobei in der Einrichtung der Fabrikanlagen hauptsächlich auf die Erzielung eines möglichst hohen Gewinnes Rücksicht genommen wurde, sind die gesundheitsschädlichen Verhältnisse in jenen Betrieben ans Licht gekommen; laut der vorgenannten Statistik sind in einem Jahre durchschnittlich angemeldet worden: (1) Erkrankungsfälle bei Arbeitern, 857 Promille, und Erkrankungsfälle bei Arbeiterinnen, 1,080 Promille; (2) Unfälle bei Arbeitern, 118 Promille, und Unfälle bei Arbeiterinnen, 40 Promille. Hierzu habe ich besonders zu bemerken, dass unter den Erkrankungen und Verletzungen alle diejenige Fälle zu verstehen sind, welche ärztliche Behandlungen bedürfen, auch wenn die Betreffenden nicht arbeitsunfähig geworden sind: (3) Todesfälle bei Arbeitern, 3.5 Promille, und Todesfälle bei Arbeiterinnen, 5.7 Promille; und (4) weil von ihrer Erkrankung nicht genesen, mussten von Arbeitern, 1.6 Promille, und von Arbeiterinnen, 17.9 Promille, entlassen werden.

Die Erkrankungen der fürsorgebedürftigen Arbeiterinnen sind meistenteils solche der Ernährungs- und Respirationsorgane, des Nervensystems u. dgl., weil der grösste Teil der Arbeiterinnen ca. 82 Prozent in der Textilindustrie und zwar in Baumwollspinnereien, Seidenspinnereien und Webereien arbeiten. Nach den Anmeldungen der Werkstätten sind in diesen Erkrankungen sehr wenige Tuberkulosefälle inbegriffen, so z. B. 1.0–3.6 Prozent in Baumwollspinnereien, 0.7 Prozent in Seidenspinnereien und 0.1 Prozent in Webereien; die Sterblichkeitsstatistik des Kaiserlichen statistischen Amtes jedoch weist deren ziemlich viele, nämlich über 30 Prozent der Todesfälle bei Textilarbeiterinnen auf. Unsere vielseitigen Untersuchungen haben ausserdem dargetan, dass unter den von den Werkstätten in ihre Heimat Entlassenen auch verhältnismässig viele tuberculös oder tuberculösverdächtig erkrankt oder gestorben sind, so beträgt nämlich die Zahl der Erkrankungen und Todesfälle unter allen aus verschiedenen Ursachen nach der Heimat

zurückkehrenden Arbeiterinnen zusammen ca. 28 Prozent, unter welchen die tuberculösen und tuberculösverdächtigen 37.2 Prozent ausmachen.

Ueber die Entlassung der Arbeiterinnen habe ich hier ein paar Worte hinzuzufügen, weil die Zustände vielleicht etwas anders als in anderen Ländern sind; man stellt besonders in manchen Textilindustrien meist Bauermädchen von verschiedenen Bezirken als Arbeiterinnen unter gewissen Vertragsbedingungen an, nimmt sie in bestimmte Wohnungen auf und beschäftigt sie dann zu anstrengend; deshalb fordern die Arbeiterinnen bei irgend einer Gelegenheit die Entlassung, was für die Economie der Betriebe sehr nachteilig ist, da man stets viele kränkliche, schwache Arbeiterinnen, oder aber neu aufgenommene unerfahrene beschäftigen muss.

Aus solchen hygienischen und socialen Gründen ist erst im vergangenen Jahre ein neues Fabrikgesetz erlassen worden, welches durch eine Kaiserliche Verordnung bald in Kraft treten wird, während die Werkstätten bis jetzt nur in Bezug auf Schutzmassnahmen bei Dampfmaschinen und anderen Motoren revidiert und zugleich auch durch Bezirkserlasse in hygienischer, sittlicher, etc., Beziehung beaufsichtigt werden.

Das Gesetz lautet wie folgt:

FABRIKGESETZ VOM 28. MÄRZ 1911.

§ I. Dieses Gesetz findet auf die nachstehend genannten Werkstätten Anwendung: (1) Solche, die im allgemeinen mehr als 15 Arbeiter beschäftigen; (2) solche, deren Betrieb gefährlich oder gesundheitsschädlich ist.

Durch Kaiserliche Verordnung können nötigenfalls Betriebe von diesem Gesetz ausgenommen werden.

§ II. Der Unternehmer darf Personen unter 12 Jahren nicht beschäftigen mit Ausnahme derjenigen über 10 Jahre alten Personen, die bei Inkrafttreten dieses Gesetzes bereits in Arbeit stehen.

Zu leichteren Beschäftigungen kann unter Bedingungen, die sich aus der Arbeit ergeben, die Verwendung über 10 Jahre alten Personen durch die Verwaltungsbehörde gestattet werden.

§ III. Der Unternehmer darf Personen unter 15 Jahren und Frauen nicht länger als 12 Stunden täglich zur Arbeit verwenden.

Während 15 Jahren nach Inkrafttreten dieses Gesetzes kann der zuständige Minister je nach der Art des Betriebs die im vorstehenden Paragraphe festgesetzte Arbeitszeit bis zu 2 Stunden verlängern.

Die Arbeitszeit ist, auch wenn die Arbeitsstätte wechselt, den in den beiden vorstehenden Absätzen enthaltenen Bestimmungen entsprechend zu berechnen.

§ IV. Der Unternehmer darf Personen unter 15 Jahren und Frauen in der Zeit zwischen 10 Uhr abends und 4 Uhr morgens nicht beschäftigen.

§ V. In den folgenden Fällen findet die im vorstehenden Paragraphe getroffene Bestimmung keine Anwendung: (1) Wenn die Arbeit aus besonderen Gründen ununterbrochen durchgeführt werden muss; (2) wenn besondere Gründe für Nachtarbeit vorliegen; (3) wenn im Falle, dass Tag und Nacht ununterbrochene Arbeit notwendig ist, die Arbeiter in zwei oder mehr Schichten geteilt und abwechselnd verwendet werden.

Doch dürfen, wenn nach Inkrafttreten dieses Gesetzes 15 Jahre verflossen sind, Personen unter 14 Jahren und Frauen unter 20 Jahren in der Zeit zwischen 10 Uhr abends und 4 Uhr morgens nicht mehr beschäftigt werden.

Der zuständige Minister bestimmt, welche Arbeitsarten zu den im vorstehenden Absatz genannten Fällen zu rechnen sind.

§ VI. Falls die Arbeiter in zwei oder mehr Schichten geteilt und abwechselnd beschäftigt werden, finden die Bestimmungen des § 4 während 15 Jahren nach Inkrafttreten dieses Gesetzes keine Anwendung.

§ VII. Der Unternehmer muss den Personen unter 15 Jahren und Frauen jeden Monat wenigstens 2 Ruhetage gewähren; und falls die Arbeiter in zwei Schichten geteilt sind und abwechselnd in der Zeit zwischen 10 Uhr abends und 4 Uhr morgens arbeiten, oder im Falle des § 5, Absatz 1, No. 2, wenigstens 4 Tage; auch muss er falls die tägliche Arbeitszeit über 8 Stunden beträgt, wenigstens 30 Minuten, und falls sie über 10 Stunden beträgt, wenigstens eine Stunde Ruhezeit gewähren. Diese Ruhezeit ist in die Arbeitszeit einzurechnen.

Wenn die Arbeiter in zwei oder mehr Schichten geteilt sind und abwechselnd in der Zeit zwischen 10 Uhr abends und 4 Uhr morgens arbeiten, muss die Reihenfolge der Arbeitszeit mindestens alle 10 Tage gewechselt werden.

§ VIII. Im Falle von unabwendbaren Naturereignissen und grossen Veränderungen kann der zuständige Minister für bestimmte Bezirke und bestimmte Arbeitsarten nötingenfalls die Paragraphe 3–5 und die Bestimmungen des vorstehenden Paragraphes ausser Kraft setzen.

Aus unabweisbaren Gründen kann der Unternehmer in unerwarteten notwendigen Fällen, nachdem er die Erlaubniss der Verwaltungsbehörde eingeholt hat, für eine bestimmte Frist ohne Rücksich auf die Bestimmungen der Paragraphen 4 und 5 die Angestellten arbeiten lassen und die im vorstehenden Paragraphe genannten Ruhetage aufheben.

In unvorhergesehenen notwendigen Fällen kann der Unternehmer, nachdem er zuvor jedesmal der Verwaltungsbehörde davon Anmeldung gemacht hat, die Arbeitszeit während 7 Tagen im Monate bis zu höchstens 2 Stunden täglich verlängern.

Je nach der Jahreszeit und im Falle dringender Arbeit darf der Unternehmer für eine bestimmte Frist, nachdem er zuvor die Erlaubniss der Verwaltungsbehörde eingeholt hat, während höchstens 120 Tagen im Jahre die Arbeitszeit um höchstens eine Stunde verlängern. In diesem Falle findet für die zugestandene Frist die Bestimmung des vorstehenden Absatzes keine Anwendung.

§ IX. Der Unternehmer darf Personen unter 15 Jahren und Frauen nicht zu den folgenden gefährlichen Arbeiten heranziehen: Zur Reinigung, Einölung, Untersuchung und Ausbesserung gefährlicher Teile an Kraft- und Arbeitsmaschinen, die in Bewegung sind, zum Auflegen und Abnehmen von Riemen und Tauen an Kraft- und Arbeitsmaschinen, die in Bewegung sind.

§ X. Der Unternehmer darf Personen unter 15 Jahren nicht in Betrieben verwenden, wo mit Giften, Halbgiften oder anderen gefährlichen Chemikalien, mit Explosirstoffen, Feuerwerkkörpern oder feuergefährlichen Materialien gearbeitet wird, auch nicht an Plätzen, wo Pulver und Staub sich stark entwickeln, wo schädliche Gase ausströmen, oder solche die sonst gefährlich und ungesund sind.

§ XI. Der zuständige Minister verordnet, welche Arbeiten von den zwei vorstehenden Paragraphen betroffen werden.

Der zuständige Minister verordnet, in wie weit die Bestimmungen des vorstehenden Paragraphen auf Frauen über 15 Jahren Anwendung finden.

§ XII. Der zuständige Minister kann die Arbeit von Kranken oder Wöchnerinnen beschränken oder gänzlich untersagen.

§ XIII. Die Verwaltungsbehörde kann, wenn sie erkannt hat, dass die Werkstätte oder die damit zusammenhängenden Gebäude oder Einrichtungen gefährlich, gesundheitsschädlich oder unsittlich sind, oder dem öffentlichen Interesse zuwiderlaufen, dem Unternehmer die zur Verhütung von Schaden oder Beseitigung von Uebelständen erforderlichen Massnahmen anbefehlen oder dem Unternehmer nötigenfalls die Benutzung der ganzen Anlage oder eines Teiles derselben untersagen.

§ XIV. Der betreffende Beamte darf die Werkstätte und die damit zusammenhängenden Gebäude besichtigen, muss aber eine diesbezügliche Ausweiskarte bei sich tragen.

XV. Wenn der Arbeiter ohne eigenes grosses Verschulden bei der Arbeit verletzt worden, erkrankt oder gestorben ist, so muss der Unternehmer dem Arbeiter oder seiner Familie nach Massgabe Kaiserlicher Verordnung Unterstützung gewähren.

§§ XVI–XXV enthalten andere Verwaltungs- und Strafbestimmungen.

Näheres über Ausführung dieses Gesetzes wird durch Ministerialverordnung bestimmt werden; ich werde hier nur kurze Erklärungen zu einzelnen Paragraphen zufügen:

Zu § 1: Im allgemeinen sind diejenigen Werkstätten, die weniger als 5 Arbeiter beschäftigen, Hausindustrien, bei welchen meistens die vorerwähnte schöne ererbte Sitte herrscht, nach der Arbeiter und Arbeitgeber in familiärem Verhältnis leben, und wo das Gesetz deshalb keine Anwendung zu finden braucht; aber wenn die Arbeiter in Betrieben, wo mit Giften, Explosivstoffen etc., oder unter starker Entwickelung von Pulver und Staub gearbeitet wird, beschäftigt werden, so wird das Gesetz nach Absatz 1, No. 2, angewandt. Die Ausnahmebestimmung, Absatz 2, meint überhaupt nicht gefährliche und nicht gesundheitsschädliche Handwerkstätten, wo vielleicht weniger als 20 oder 25 Arbeiter angestellt sind.

Zu § 2: Als untere Grenze des Arbeiteralters sind 12 Jahre ziemlich wenig, aber bei uns vollenden die Kinder in diesem Lebensjahre meistens ihre Schulpflicht. Diese schulentlassenen Kinder armer Leute müssen in den Werkstätten als Hilfsarbeiter ihre leichte Arbeit finden können; und da die Anzahl von 10–12 Jahre alten Arbeitern, welche bereits in Arbeit stehen, nur 0.79 Prozent gerechnet wird, so dürfen diese noch 2 Jahre nach Inkrafttreten des Gesetzes in ihrer Stellung belassen werden.

Absatz 2 ist die Bestimmung, bei welcher die 10–12 Jährigen nur unter gewissen Bedingungen wie z. B. bei ganz leichter, nicht gesundheitsschädlicher Arbeit täglich nicht über 6 Stunden und mit vollgesunder körperlicher Entwickelung beschäftigt werden dürfen. Was die Schulpflicht anbetrifft, so wird die betreffende Kaiserliche Verordnung nicht durch dieses Gesetz umgestossen; die Kinder sind natürlich schulpflichtig, indem sie zugleich die Armenschule besuchen oder in den Werkstätten gehörig unterrichtet werden.

Zu § 3: Bei fast allen Werkstätten mit anstrengender Arbeit beschäftigen die Unternehmer über 17 oder 18 Jahre alte Arbeiter täglich nicht über 8–10 Stunden, aber bei Textilindustrie jüngere Arbeiterinnen manchmal 14 oder 15 Stunden täglich, was durch diese Bestimmung bis zur Minimalgränze herabgezogen werden muss.

Die Ausnahmbestimmung, Absatz 2, meint solche Betriebe, die überhaupt wenig anstrengend und in der Regel nicht das ganze Jahr hindurch fabricieren.

Zu §§ 4 und 5: Für Jugendliche und Frauen wird die Nachtarbeit principiell verboten; aber in besonderen Fällen muss man Ausnahmen machen, z. B. bei Einkochen und Conservieren von leicht in Fäulniss übergehenden Fisch- und Muschelarten, welche manchmal auf einmal verarbeitet werden müssen, oder in Druckereien der Morgenzeitungen,

oder bei Glas- und Porcellanfabriken mit ununterbrochenen Feuerung etc., denn nach dem Uebergangsstadium dürfen Männer über 14 Jahre und Frauen über 20 Jahre damit beschäftigt werden.

Zu § 6: Gegenwärtig werden nur in Baumwollspinnereien die Arbeiterinnen in 2 Schichten geteilt und meist alle 8 Tage mit einem Ruhetage abwechselnd zur Tages- und Nachtarbeit verwendet; diese Nachtarbeit verursacht den Arbeiterinnen so grosse Beschwerden, dass sie ihre baldige Entlassung von den Werkstätten nachsuchen, da Körpergewichtsabnahme oder Ernährungsstörung etc., eintritt, deshalb muss man vom hygienischen Standpunkt vor allem diese Nachtarbeit aufheben; aber andererseits vom ekonomischen Standpunkt aus betrachtet könnte man die Nachtarbeit nicht ohne grossen Schaden wegfallen lassen, es sei denn, dass man den Betrieb um das Doppelte erweiterte, um bei nur Tagesarbeit die gleiche Produktion zu erzielen. Man ist genötigt 15 Jahre zu warten, ehe sich der principielle Zustand herstellen lassen wird.

Zu § 7: Bei uns herrscht seit altersher die Sitte, den Arbeitern in der Regel am 1. und 16. Tage im Monat und bei neu entwickelten Werkstätten meist an jedem Sonntag Ruhe zu gewähren. Doch giebt es auch solche Stätten, in welchen die Unternehmer den Angestellten keinen Ruhetag und keine Arbeitspause gewähren und wo die Arbeiter des grösseren Verdienstes wegen sie auch nicht wünschen, deshalb wird hier die Minimalgrenze bestimmt.

Zu § 8: Die Ausnahmebestimmung, Absatz 1, ist im Falle von unabwendbaren Naturereignissen etc., selbverständlich, um die Ordnung herzustellen. Ueber die Bestimmungen, Absätze 2, 3 und 4, muss die Behörde immer vorsichtig ihre Erlaubniss beschränken und streng beurteilen, ob es unbedingt notwendig ist.

Zu §§ 9, 10 und 11. Für die unerfahrenen Jugendlichen und nicht genug ausgebildeten Frauen sind die in den Bestimmungen genannten Beschäftigungen gefährlich und gesundheitsschädlich, bei welchen durch kleine Fehler grosse Gefahren verursacht werden können.

Zu § 12: Den Kranken, deren Erkrankungen sich durch ihre Beschäftigung verschlimmern könnten oder die durch Ansteckungsmöglichkeit ihre Umgebung gefährden würden, ist bis zur Genesung und den Wöchnerinnen wenigstens 4 Wochen lang nach der Entbindung die Arbeit verboten.

Zu § 13: Diese Bestimmung soll Anwendung finden, um voraussichtlichen Schaden zu verhüten oder schon entstandene Uebelstände zu beseitigen; aber nach unserer Ansicht sind die hygienischen Einrichtungen die Hauptsache für das Arbeiterwohl, wir müssen deshalb immer bestrebt sein, nicht nur kraft des Gesetzes Verbesserungen zu fordern, sondern die Unternehmer darin zu unterstützen, allmählig recht hygienische Vorkehrungen zu treffen.

66692—VOL 3, PT 2—13——28

Zu § 14: Um die Ausführung des Gesetzes zu revidieren, müssen die entsprechenden Inspectoren angestellt werden.

Zu § 15: Gegenwärtig werden in manchen Werkstätten die Arbeiter, wenn sie infolge der Arbeit verletzt oder erkrankt sind, umsonst in Hospitälern der Werkstätten oder bei den angestellten Aerzten behandelt, wenn sie gestorben sind, ihren Familien gewisse Unterstützungen gewährt; bei sonstigen Fällen werden die Angestellten sehr billig behandelt oder gewissermassen unterstützt; indem man in manchen Werkstätten Betriebskassen einrichtet. Aber gegenwärtig geschieht es ganz freiwillig, erst durch diese Bestimmung wird die Unterstützung obligatorisch.

Wie ich oben geschildert habe, trifft unser neues Gesetz nur minimale Fürsorge für jugendliche Arbeiter und Arbeiterinnen; es muss daher unser Bestreben sein, im gegenwärtigen Uebergangsstadium die japanischen Industrien darauf zu bringen, dass wir ausser Anwendung des Gesetzes vor allem manche unverständige Unternehmer zur Einführung notwendiger Verbesserungen bewegen und innige Beziehungen zwischen Hygiene und Ekonomie der Industrien herstellen, um allmählige Vervollständigung der gewerbhygienischen Einrichtungen zu erwarten.

THE RELATION OF THE UNITED STATES BUREAU OF LABOR TO INDUSTRIAL HYGIENE.

CHARLES H. VERRILL, of the United States Bureau of Labor.

Unlike the State factory-inspection departments and the State boards of health, the Federal Bureau of Labor is not charged with the duty of enforcing laws or formulating regulations. Its functions are limited to the work of investigation and study and the diffusion of information, but with these limitations—that the duty is imposed on the Bureau of studying the means of promoting the material, social, intellectual, and moral prosperity of the working men and women. It is quite within its scope, therefore, to study the subject of accidents with a view to the elimination, so far as possible, of dangerous machinery and dangerous working conditions, and the introduction of protective devices, or to study factory processes and conditions with a view to eliminating, restricting, or safeguarding the use of poisonous and injurious materials, or to study lighting, ventilation, humidity, the disposal of dust or fumes, and the improvement of the hygienic condition of the working places.

The work of the Bureau has, of course, been limited by the means and force at its disposal. Beginning first with its report on industrial depressions, in 1886, its earlier work, employing the statistical method in extensive investigations, dealt for the most part with general labor

questions where public interest was making the most numerous and pressing calls for information.

The first work of the Bureau of Labor which might be regarded as touching the field of industrial hygiene was the study of workmen's accident insurance and compensation. This was naturally so, from the fact that the consequences of accidents bear most acutely upon the workman and his family, while the effects of unhygienic conditions are more obscure and more gradual, although affecting much larger numbers.

But, strictly speaking, much that is of the greatest value to industrial hygiene comes out of the efforts to prevent accidents and to remedy dangerous and injurious conditions. The first step in any well-considered plan of accident prevention involves a cleaning up of the shop. Safety and sanitation go hand in hand. Attention to measures for safety results directly in improvements in hygiene.

The work relating to industrial hygiene proper was taken up later by the Bureau of Labor, and has been developed as a better understanding has come of the importance of industrial dangers due to the hazards of machinery, dangerous or poisonous materials, or to insanitary working conditions. For views of what dangers must be regarded as necessary, and to be accepted without protest, have changed in recent years, as greatly in the field of industrial hygiene proper, as in the matter of accidents of industry. No longer is the view generally accepted that the employees may reasonably be asked to assume the risks of insanitary employment, but rather that both employers and public authorities have distinct duties to know and to make use of the best practicable methods for the protection of the health as well as the safety of men, women, and children in industrial and other employments.

Classing the work which the Bureau of Labor has already done in what we may call the broad field of industrial hygiene under two heads, (1) accidents and relief and insurance of workmen; (2) factory inspection and occupational or industrial hygiene, brief mention may properly be made first of the reports under the first head:

Relating to accidents and relief and insurance of workmen, more than 20 bulletin articles and reports have been published, beginning with a special report on compulsory insurance in Germany in 1893, the first American publication on the subject, and later covering the legislation, the accident and sickness statistics, and the details of the experience of all the important industrial countries where a system of insurance or compensation for accidents, sickness, invalidity, or unemployment is in force. In addition, several special studies have been made of accidents in selected industries in the United States. One of these deals with the cotton-textile industry and another with the employment of women in the metal trades. A third report, much

more detailed and elaborate, is the result of a comprehensive study of accidents and accident prevention in the iron and steel industry in the United States.

In the group of reports relating to factory inspection and occupational hygiene are included articles in regard to the inspection of factories and workshops in this and in foreign countries. The details in regard to factory legislation and inspection, the regulation of working conditions, especially in industries and occupations involving special dangers, have been the subjects of particular attention. Special studies have also been made of the mortality and morbidity in certain dangerous occupations and of the dangers to employees who, in the course of their work, come in contact with certain poisonous materials. Under this head, of the greatest importance are the studies of phosphorus poisoning in the match industry and of lead poisoning in the white-lead industry and in the manufacture of pottery, tiles, and porcelain enameled sanitary ware. In all of these industries investigation has disclosed the existence of dangerous conditions, most of which may be entirely eliminated, or very greatly improved, without serious difficulty. All of these investigations have strongly emphasized the fact that, by a study of working conditions in the more dangerous and unhealthful occupations, the methods and experience of the best factories may be made available for those factories where, because of ignorance or because of indifference resulting from ignorance, dangerous conditions have been allowed to continue without any technical necessity and without any economic need.

Reports and bulletins issued by the Bureau of Labor since January, 1908, relating wholly or in part to industrial hygiene, are as follows:

REPORTS.

Investigation of Telephone Companies. (Printed as S. Doc. No. 427, 61st Cong., 2d sess.) 1910. Includes "Character and severity of the work"; "Care for health of operatives"; "Location and size of operating rooms and air space per person"; "Effect of work upon health of operatives."

Strike at Bethlehem Steel Works, South Bethlehem, Pa. (Printed as S. Doc. No. 521, 61st Cong., 2d sess.) 1910. Includes "Accident record and relief and benefits in cases of accident, sickness, and death."

Report on Condition of Woman and Child Wage Earners in the United States. (Printed as S. Doc. No. 645, 61st Cong., 2d sess.) 1910–1912.

Vol. I. Cotton-Textile Industry. Includes "Hygienic conditions of mills," covering lighting, ventilation and humidity, dust and lint, and spitting on floors; also "Cotton-mill processes and occupations," covering physical conditions and requirements of individual occupations.

Vol. II. Men's Ready-made Clothing. Includes "Health and hygienic conditions" in home work; also "The clothing shop and working conditions," covering ventilation, fire escapes and fire protection, elevators, wash rooms, dressing rooms, water-closets, and lunch rooms.

Vol. III. Glass Industry. Includes "Difficulty and physical strain of the work"; "Working conditions in the furnace room," covering dust and fumes, heat conditions, flooring and its condition, overcrowding, toilet accommodations; "Causes of death of glass blowers and diseases of glass workers"; "Occupations of women and girls"; "Working conditions affecting women and girls," covering lighting, ventilation, and overcrowding, fire escapes and fire protection, wash rooms and dressing rooms, lunch rooms, water-closets, and accidents; "Relation of the work to health" in the employment of women and girls in making incandescent electric lamps, special features of the work and factory and working conditions.

Vol. IV. Silk Industry. Includes "The silk mill and working conditions," covering construction and surroundings, fire escapes and fire protection, light and ventilation, water-closets, wash rooms and dressing rooms, and lunch and rest rooms; also silk-mill processes and occupations, covering the physical requirements of individual occupations, safeguarding of machinery and speeding of machinery, and working conditions.

Vol. IX. History of Women in Industry in the United States. Includes "Health and intensity of labor before 1880 in textile factories."

Vol. XI. Employment of Women in Metal Trades. Includes "Legal provisions against industrial dangers and diseases"; "General factory conditions," covering light and ventilation, removal of dust and fumes, general sanitation, dressing rooms and wash rooms, and lunch rooms; "Distribution of accidents through the hours of the day"; "Speed of production from hour to hour."

Vol. XII. Employment of Women in Laundries. Includes "General conditions of the workrooms in laundries," "Character of the work in power laundries by occupations," "Effect of laundry work upon health."

Vol. XIII. Infant Mortality and Its Relation to the Employment of Mothers.

Vol. XIV. Causes of Death Among Women and Child Cotton-mill Operatives. (In press.)

Vol. XVIII. Employment of Women in Selected Industries. (In press.) Includes Physical conditions and requirements of the work in many industries and occupations.

Vol. XIX. Labor Laws and Factory Conditions. (In press.) Includes Analysis of laws and text of laws relating to factory inspection and employment of women and children; also, Conditions existing in typical factories in 17 States, covering legal age, prohibited employments, hours of labor, night work, safeguarding, accidents, comfort of employees, and ventilation and sanitation.

Report on Conditions of Employment in the Iron and Steel Industry in the United States. (Printed as S. Doc. No. 110, 62d Cong., 1st sess.) 1912.

Vol. III. Working Conditions and the Relations of Employers and Employees. (In press.) Includes Physical conditions and requirements of various occupations; Plans for eliminating the 7-day week and the 12-hour day, overtime work, working conditions and efficiency as affected by heat, working conditions and efficiency as affected by speed and severity of the work, character and severity of the work in 1895 and in 1910.

Vol. IV. Accidents and Accident Prevention. (In press.) Detailed study of accidents by departments and occupations covering rates per 1,000 employees, duration of disability, nature of injury, hour of the accident, causes of accidents, relation to night work, relation to long hours, relation to inability to speak English, safeguarding methods, development of safety work, etc.

BULLETINS.

No. 75. March, 1908. Industrial hygiene, by George M. Kober, M. D.

No. 79. November, 1908. Mortality from consumption in dusty trades, by Frederick L. Hoffman.

No. 80. January, 1909. Woman and child wage earners in Great Britain, by Victor S. Clark, Ph. D. Includes Laws and regulations in dangerous and injurious trades and processes, half-time system as affecting health of child workers, influence of factory acts upon the general welfare of workers.

No. 82. May, 1909. Mortality from consumption in occupations exposing to municipal and general organic dust, by Frederick L. Hoffman.

No. 85. November, 1909. Review of labor legislation of 1908 and 1909, by Lindley D. Clark. Laws of various States relating to labor enacted during 1908 and 1909. Include laws relating to factory inspection and industrial hygiene.

No. 86. January, 1910. Phosphorus poisoning in the match industry, by John B. Andrews, Ph. D. List of industrial poisons, prepared for the International Association for Labor Legislation by Drs. Th. Sommerfeld, Thomas Oliver, and Felix Putzeys. International Association for Labor Legislation and its publications. (Brief description of the work of the association and bibliography of its publications, many of which relate to industrial hygiene.)

No. 89. July, 1910. Child-labor legislation in Europe, by C. W. A. Veditz, Ph. D. (includes legislation and regulations as to hygiene and safety, prohibited occupations, rest periods in working day, effect of home work on children, factory laws and regulations, factory inspection, in Austria, Belgium, France, Germany, Italy, and Switzerland).

No. 91. November, 1910. Working hours of wage-earning women in selected industries in Chicago, by Marie L. Obenauer (includes long hours and physical character of work). Review of labor legislation of 1910, by Lindley D. Clark. Laws of various States relating to labor enacted during 1910 (includes laws relating to factory inspection and industrial hygiene).

No. 92. January, 1911. Resolutions of Sixth Delegates' Meeting, International Association for Labor Legislation (includes administration of labor laws, child labor, night work, hours of labor, industrial poisons, work in compressed air, prevention of accidents, workmen's insurance). Report of Illinois Commission on Occupational Diseases. (Summary of report.)

No. 95. July, 1911. Industrial lead poisoning, with descriptions of lead processes in certain industries in Great Britain and the western States of Europe, by Sir Thomas Oliver, M. D. White lead industry in the United States, with an appendix on the lead oxide industry, by Alice Hamilton, M. D. Deaths from lead poisoning (actually reported) in New York State in 1909 and 1910, by John B. Andrews, Ph. D. Laws enacted during 1911 requiring the report of occupational diseases.

No. 96. September, 1911. Working hours, earnings, and duration of employment of women workers in selected industries of Maryland and of California, by Marie L. Obenauer (includes long hours and high-pressure methods, physical character of work, and sanitary conditions). Employment of children in Maryland industries, by Marie L. Obenauer and Mary Conyngton (includes long hours and physical character of work). Attitude of Massachusetts manufacturers toward the health of their employees, by Wm. C. Hanson, M. D.

No. 97. November, 1911. Review of labor legislation of 1911, by Lindley D. Clark. Laws of various States relating to labor enacted during 1911 (include laws relating to factory inspection and industrial hygiene).

No. 98. January, 1912. Conciliation, arbitration, and sanitation in the cloak, Clark. Laws of various States relating to labor enacted during 1911 (includes detailed study of work and methods of joint board of sanitary control).

No. 100. May, 1912. List of industrial poisons and other substances injurious to health found in industrial processes, prepared by Dr. Th. Sommerfeld and Dr. R. Fischer and edited by the permanent advisory council of hygiene of the International Association for Labor Legislation. Act providing for a tax on white phosphorus matches and prohibiting their import or export.

No. 101. July 1, 1912. Care of tuberculous wage earners in Germany, by Frederick L. Hoffman.

No. 104. August 7, 1912. Lead poisoning in potteries, tile works, and porcelain enameled sanitary ware factories, with appendix on hygienic conditions and regulations in potteries, tile works, and enameled sanitary ware factories in Great Britain, Germany, and Austria, by Alice Hamilton, M. D. (In press.)

The following studies relating wholly or in part to industrial hygiene are now being carried on:

Lead poisoning and methods of its prevention in the various lead-using industries and occupations. On this subject two studies have already been published, one relating to white and red lead factories, and the other to potteries, tile works, and porcelain enameled sanitary ware factories.

Causes of death in the various occupations of the cotton textile mill.

Employment of women in laundries: An intensive study of the problems of heat and humidity, and severity and strain of laundry work with special reference to their effect upon the health of the women employed and to the extent to which existing conditions are necessary.

Employment of women and children in pea canneries: An intensive study of the requirements of the industry, the factory equipment, and the labor supply as related to the need of long working hours; also speed, severity, and strain of the work of the various occupations.

Foreign labor legislation (to include laws in the principal industrial countries in regard to factory hygiene and inspection, especially those regulating the use of industrial poisons or dangerous or injurious materials, the prevention or disposal of dust or fumes, and the methods for providing for safeguarding the health and safety of workers).

Other studies relating to industrial hygiene will be taken up as the means and force of the bureau will permit. Among those which it is expected will be taken up during the coming year are the following:

The methods and standards of factory inspectors in the various States.

Women in industry. Studies similar in character to those already made Emphasis will be placed more and more on the conditions and requirements of the work, as in the recent studies relating to laundries and canneries.

Mortality and morbidity among workers in various industries and occupations. Much valuable material in regard to this subject exists in the records of the trade unions and of the fraternal benefit organizations.

Regulations of various countries for improving industrial hygiene and safeguarding health of workers.

The foregoing list will give a fairly clear idea of what the Bureau of Labor has already done and is now doing in the field of industrial hygiene, and the dates of publication will show how that work has

been developed and broadened and given more practical application in the last two years. The object kept constantly in view, especially in the more recent specialized studies, has been not only to ascertain the exact facts as to factory conditions endangering the health and safety of employees, but also how far such conditions are necessary to the conduct of the industry, and what practical concrete suggestions are possible to materially improve conditions.

Within the field of industry, the Bureau of Labor should be able to perform for industrial workers a service similar to that done by the Agricultural Department for the fruit grower, the stock raiser, and for other departments of agriculture. The dangers to the health and safety of workers which are incident to industrial employments should be regarded as problems calling for constant research and study in this and in other countries, in order that the safest and best methods may be known and placed at the disposal of employers and employees, and that the health and safety of the people may be conserved in the greatest possible measure.

STATE COMMISSIONS ON OCCUPATIONAL DISEASES.

Prof. CHARLES R. HENDERSON, University of Chicago.

This paper does not pretend to give a complete history of public efforts in this country to investigate diseases of industry, to agitate for legislation, and to organize administration. It aims to supply materials for a certain section of that history which ought to be carefully prepared and published.

The examples chosen will serve to illustrate: (1) The type of temporary and occasional exploration; (2) permanent central administrative agencies created by law; (3) the relation of State to Federal investigations.

I. TEMPORARY COMMISSIONS FOR EXPLORATION.

Naturally, the foundation for this whole movement was laid by the systematic studies of medical men who have given special attention to industrial hygiene. Conspicuous among the benefactors of the race was Ramazzini, whose memory should be revived in the thought of all who devote themselves to the welfare of productive operatives in our age.[1]

It would be interesting to gather up the materials for a history of the contributions of various professors of the healing science and art since the days of the great Italian pioneer; but that is not attempted in this paper. As a layman who has long sought the guidance of physicians in his labors for social legislation it is my desire to record

a word of admiration, praise, and appreciation of the long line of useful and illustrious medical men who in this great field have served the toilers and made mankind their debtors. They have rarely had other rewards for this service than those which come to the scientific man in the discovery of new truth, and to the benefactor in the satisfactions of his sympathies and his conscience.

It is quite often necessary, when evils are hidden and unrebuked, to secure public authority to drag them forth into the light of common day and expose them to the public in all their ugliness. Individuals working alone are unable to secure a hearing; their opinions are treated as academic, eccentric, and beneath the attention of practical men. But an inquest authorized by the legislature confronts politicians with an issue which can not be set aside and gives to the press a topic and materials for discussion. The value of a temporary commission created for a particular inquiry lies: (1) In the discovery of the serious dangers to which workmen are exposed, and of which neither they nor their employers are fully, if at all, aware; (2) in securing a wide cooperation of medical practitioners throughout the State, with a view to instructing patients, warning workmen, and creating public sentiment; (3) in securing improved legislation enlarging the powers and duties of factory inspectors and health authorities to cover the protection of work people in mines, mills, shops, factories, and mercantile establishments.

THE ILLINOIS COMMISSION ON OCCUPATIONAL DISEASES.

The General Assembly of Illinois in May, 1905, by unanimous vote of both house and senate, passed a resolution which authorized and requested the governor of the State to appoint a commission consisting of five representative men to serve without remuneration, whose duty it should be to investigate and report a draft of a bill providing a plan for industrial insurance and workingmen's old-age pension for consideration and action of the next general assembly. This commission made its report in 1907. Its recommendations were not acted upon, as the time was not yet ripe for social insurance legislation; but the labors of the commission bore fruit later, and a compensation law, covering industrial accident injuries only, was enacted by a subsequent legislature.

In the course of their report this commission said:

> Undoubtedly the time is not distant when industrial States must take up the problem of legislation upon sick insurance. To provide a scientific basis for such legislation, we recommend the appointment of a competent commission having the power and the means to make a thorough study of the kinds, causes, and extent of diseases among work people and the most modern methods of protection, prevention, and insurance.

The medical profession was not represented in this first commission; but it considered the situation in European countries, especially in Germany, and urged the necessity of a scientific study of occupation in relation to sickness. The word "competent" implied that the commission on occupational diseases ought to be composed chiefly of physicians.

Very soon after this report was presented, that is, in March, 1907, the Legislature of Illinois acted upon the recommendation of the industrial insurance commission, and authorized the governor to appoint a commission of nine members, to be composed of the State factory inspector, the secretary of the bureau of labor statistics, the president and secretary of the State board of health, two reputable physicians, and three other representative citizens of the State, who should serve without remuneration, and whose duties should be to thoroughly investigate causes and conditions relating to diseases of occupation, and to report a draft of a bill for the consideration of the assembly. Mr. Edgar T. Davies, the efficient chief factory inspector of Illinois, was active and effective in securing this legislation.

The governor appointed the commission, which could not, for various reasons, begin its work until the early part of the year 1910, and was obliged to close its study in December. The legislature provided $15,000 for the expenses of study and publication. Several very able physicians were employed to conduct the investigations. Dr. Alice Hamilton made a special investigation of poisoning by lead, arsenic, and mercury in the industries of Illinois. She was appointed on the commission, but resigned to take up the work of investigation.

Dr. E. R. Hayhurst, assisted by O. F. Funkhouser, M. D., and F. E. Flinn, M. D., with several investigators as assistants, studied conditions in brass foundries and other shops where lead poisoning might be expected. Dr. P. F. Becker investigated records of two hospitals for the insane to discover whether the influence of lead poisoning was discoverable there. Dr. Matthew Karasek and Dr. George L. Apfelback made an examination of the effects of gas poisoning in steel works, foundries, tailor shops, and so forth. Dr. Peter Bassoe gave attention to caisson disease. Dr. George E. Shambaugh studied cases of boilermakers' deafness. Dr. Francis Lane and Dr. John B. Ellis examined many miners for nystagmus. Medical members of the commission who selected the subjects for study directed the procedure, tested the results, and formulated the special reports were: Drs. George W. Webster, Ludvig Hektoen, Walter S. Haines, W. H. Allport, and James A. Egan. Dr. A. C. Klebs resigned because of absence from the country. Mr. James Simpson,

Mr. David Ross, and the writer were other members of the commission.

With few exceptions the establishments visited received the representatives of the commission with courtesy and aided them in their work.

The report of the committee was printed in a pamphlet of 219 pages, and laid before the governor and legislature in January, 1911. It contained a brief statement of the scope and field of industrial hygiene, including the closest possible estimate of the number of workmen exposed to industrial poisons in the industries of Illinois; also a list of industrial poisons and means of alleviation. It discussed the principles of effective legislation for the prevention of diseases of occupation, as made clear by European experience and medical science, and the administrative organization necessary to give effect to legislation. It showed that after all possible preventive methods have been used there will unavoidably remain a "trade risk" of injury which must be relieved by social insurance. It recommended that some commission, provided with larger funds, should continue this exploration for two years longer, because it was impossible for it to finish its task.

The reasons given for this request were as follows:

> We have in this report furnished abundant facts to demonstrate both the necessity and utility of further investigation. * * * It is a public and not a class interest. Such an investigation is required: 1. To furnish to the medical profession the facts which they need for their guidance in the prompt discovery of the industrial causes of many diseases. A treatment of symptoms, which ignores shop conditions and the gradual and insidious introduction of poisons into the body, is likely to fail. 2. The knowledge thus acquired will be useful to employers of labor. We here assume that no reputable manufacturer will deliberately plan to poison or kill those who are in his service. But we have already abundant evidence that employers are actually keeping work places in conditions which must inevitably result in sickness, weakness, pauperism, death, and sometimes means are known which would remove at least part of the danger. * * * 4. The burden of the diseased, crippled, and disabled workmen finally falls on the community; and the community, in self-defense, must inquire into a scientific way for the causes of that burden, to learn how to diminish its weight. 5. The employees in manufactories and their families are vitally interested in this whole matter. With them it is not merely a question of more or less money, but literally of life or death. * * * The whole people is concerned when any group of the membership is exposed to disease. * * * A constructive, protective, far-sighted public policy can not be initiated and sustained without a broad basis of facts ascertained by a thorough investigation in the hands of competent investigators, who have special training in this kind of inquiry.

The reports of the investigators were printed in full detail, and considerable information was published for legislators, physicians, and employers.

The report bore fruit immediately, and in the following law the legislature extended its protective measures to include prevention of injuries to health from conditions in work places:

An Act To promote the public health by protecting certain employees in this State from the dangers of occupational diseases. (House bill No. 250, approved May 26, 1911.)

Section 1 requires employers to adopt reasonable and approved devices, means, or methods for the prevention of occupational diseases which are incident to a work or process which presents dangers to health.

Section 2 declares specified trades, in which white lead is used, to be especially dangerous to the health of the employees, and requires the provision and use of facilities for cleanliness and of respirators where dust is created.

Section 3 requires periodical medical examination of workmen exposed to lead poison.

Section 4 makes it the duty of physicians to report cases of disease to the State board of health. Other devices and precautions are stipulated in detail, and the State department of factory inspection is required to enforce the provisions of the act. Notices of the dangers to which employees are exposed are to be posted in the places of employment. Suitable penalties are provided as sanctions of the commands of the law.

One of the results of the report was the addition of persons of medical training to the ordinary staff of factory inspectors. It was made very clear by inquiry that laymen can not detect occupational diseases nor trace their causes. Even physicians must have special training and experience to be effective. The need of a museum and clinic was only too apparent, and the Milan institution excited our envy. We are again indebted for a great idea to the land of Ramazzini.

The New York factory investigating commission is a good example of the temporary organization for exploration of conditions. It is no reflection on the department of labor that such an inquiry should be thought necessary. A department of inspection must confine itself to a circle of duties prescribed and limited by the law creating it, and it can not well enter other fields, however great the necessity and demand. An exploring commission has much wider range of investigation. The preliminary report of this New York commission states the legal basis of its work in this proposition:

The State not only possesses the power and the right, but it is charged with the sacred duty of seeing that the worker is properly safeguarded in case of fire; that he is protected from accidents caused by neglect or indifference; that proper precautions are taken to prevent poisoning by the materials and processes of his industry; and that he works under conditions conducive to good health and not such as breed disease.

This commission is not composed of medical men, but appointed Dr. George W. Price to conduct the investigations into sanitary conditions. The immediately exciting cause for the appointment of the commission was a tragic conflagration in which the fire risk was sensationally prominent and engineering problems were primarily considered. As the study advances the less spectacular but more constant and insidious dangers of disease secure a larger share of attention.

II. PERMANENT CENTRAL DEPARTMENTS HAVING DUTIES RELATING TO OCCUPATIONAL DISEASES.

For many years the University of Wisconsin has quietly but strongly done its duty and made its influence felt in persuading legislators to act on rational, scientific grounds, rather than from blind instinct and with incomplete information. One of the results of this persistent effort is the creation of a bureau for collecting facts for the lawmakers; another is the industrial commission.[2]

This commission is composed of three members.

> The legislature lays down the general rule that every employer shall furnish to his employees the necessary protection to life, health, safety, and welfare. This places the obligation on the employer * * *. But it is not left to the employer to tell what are those safe methods and processes nor is it left to the factory inspectors. To the industrial commission is assigned the duty of investigating and ascertaining what safety devices and safeguards, what means, methods, and processes are best adapted to render the factory safe. Having ascertained what they are, the commission issued an order prescribing that they shall be installed for each factory or each class of factories.

If an employer is dissatisfied with a report of an inspector he can appeal first to the commission and then to the courts. The employers are heard when general rules are adopted by the commission.

MEDICAL *v.* LAY DIRECTION OF ADMINISTRATION.

Among the forms of permanent State administration of shop hygiene and sanitation there are two types, namely, the medical and the lay control; one related to the health department, the other to factory inspection and the labor bureau. The history of the particular State accounts for the origin of each type.

A good deal can be said in favor of medical control. Matters of injury to the body, whether from so-called accidents or from poisons, should evidently come under the trained observation of a physician at the earliest possible moment. Whether we consider causes, conditions, symptoms, effects, remedies, or prevention, it is the physician who should have the decisive word. The merely mechanical side, machines and devices for protection, can certainly be quite as well understood by a physician, after some experience, as by the average

inspector. Where technical questions are involved, it is not difficult to provide engineers or skilled mechanics.

Nor is it seemly to subordinate educated and skillful physicians to others. Their superior knowledge should have corresponding respect and not be liable to be set aside by a superior in rank who can not understand the reasons for a doctor's orders.

The Massachusetts plan, therefore, is recommended by the principle of control by experts. This plan has the great advantage that it solves the problem of civil service examinations and freedom from the spoils system, for the diploma from a medical college recognized and approved by the State is a guaranty at least of education for the essential work of the office of inspector. There are, of course, political appointments of doctors, but the danger is certainly small in comparison with that in the ordinary system. It goes without saying that even a physician must serve an apprenticeship under an experienced inspector.

If it is claimed that the appointment of an occasional medical inspector is sufficient, we may express doubt. The subordinate position is not attractive to a capable man in the medical profession and will tend to draw only from the inferior grade.

When shop hygiene is a part of the care of a State department of health it is closely related to the whole system of public sanitation and hygiene. The shop, the home, the street, public conveyances, sewerage, are all closely related to the health of workingmen. I would seem natural, therefore, to bring shop hygiene under the general control of the medical division of the State administration.

Much can reasonably be said in favor of the system in which shop hygiene is made a function of the State department of labor. It is necessary to have a corps of inspectors to prevent accidents and to enforce laws relating to child labor and to hours of labor. Conditions of health are inextricably linked with conditions of safety, comfort, and convenience, and it seems to many that all should be subject to one control.

It is now admitted that inspection must have the services of specialists, not only in medicine but in trade processes; the technical processes of a mine are unintelligible to an inspector of woodworking, painting, or printing. The medical inspector thus comes to be regarded as just one more specialist.

To overcome the difficulty of securing thoroughly competent direction of the medical side of inspection where laymen are in control, and to promote scientific research of causes of occupational disease, it would seem wise to appoint distinguished directors of laboratories as members of a consulting staff to advise with the department of labor. This would lift the work of the department out of deadening

routine and bring into the ordinary procedure the spirit of fervent and eager, alert inquisitiveness which keeps the administration alive. In some such way as this every shop hospital would become a clinic in occupational diseases and a school of medical instruction. Experience has proved that this of itself attracts the attention and interest of the most able men of science in the medical profession, who have hitherto, in this country, too much neglected this realm of their art.

The Federal Bureau of Labor and the projected bureau of health have a function of vast importance in the field of investigation. Here again will arise the problem of a proper division of labor between two classes of expert investigators, the medical and the industrial; but an adjustment will be reached and the vast resources of the Nation will be brought into the campaign against ignorance and disease.

In the State investigation of lead poisoning it was found that the mines were in one State while the chief industries using lead as raw material were in others, and that the transporting agencies extended everywhere, all being exposed to peril. It is inevitable and desirable that the Federal authorities shall not only investigate conditions, but also use the national legal power to control the danger from poison incident to interstate commerce.

APPENDIX.

The department of labor of New York has improved its service by introducing medical inspection and laboratory work. The report of Mr. John Williams, commissioner, for 1911, says that intensive work in the field of industrial hygiene has been pushed forward, and that definite methods for analytical investigations to determine dangerous factors incident to the various industries have been adopted. Deputy Factory Inspector Vogt, formerly a sanitary inspector in the State health department, was assigned to this division, and a splendid library has been placed at the disposal of the department for research. Already encouraging results have been secured.

---

[1] My copy of his work is entitled: "Bernardini Ramazzini, in Patavino Gymnasio Practicae Medicinea Professoris Primarii de Morbis Artificum Diatriba, Mutinae olim edita. Patavii Kal. Sep. 1713; pp. 470–687 of Bernardini Ramazzini, Opera Omnia, etc. Genevae, MDCCXVII; Cramer et Perachon.

[2] Paper of John R. Commons, American Labor Legislation Review, vol. I, No. 4.

GOVERNMENT STUDY OF OCCUPATIONAL DISEASES.

Prof. JOHN R. COMMONS, of the Industrial Commission of Wisconsin.

We concede that in legislation and administration for the protection of health and safety of employees we are behind the nations of Europe. This is due partly to ignorance through lack of investigation, partly to piecemeal legislation that hits one evil at a time when it gets sufficiently exposed, partly to the veto of our courts.

But the courts have begun to recognize another branch of government. This branch has come forth especially to provide for that extension of the police power required to meet the rapidly changing and widely varying conditions of modern life and business. It therefore combines, to a certain degree, the activities of legislation, execution, and judgment; but its peculiar activity, which gives it a separate place as the custodian of the police power in the body politic, is that of investigation.

The doctrine which the court applies to this function of investigation is both the noblest and the most practical of legal doctrines—reasonableness. By this doctrine the court applies its philosophy to the particular facts, but requires that all of the facts be taken into account. It may be that the critics of the judiciary have not performed their part in bringing before the court all of the facts of the modern development of industry and society which the doctrine of reasonableness requires. Counsel often leaves the court in the predicament of falling back on its own knowledge of what is "common knowledge." Often this kind of knowledge is several years behind the times, because a serious injury to the common good usually arises and spreads extensively before the scientific experts and the journalistic agitators are able to make it a matter of common knowledge. The investigative branch of government should be the one that furnishes the court with judicial knowledge of injury to the public in advance of common knowledge. Being also an administrative branch, it should carry over promptly the results of scientific investigation into their practical application. Its function of the police power is the power of reasonable regulation through constructive investigation.

The several States and the Federal Congress have recently sought in various fields to elevate this work of investigation to the high position in our frame of government that the courts had assigned to it in the procedure of government. The legislatures had previously, from time to time, broken up the executive department by creating separate departments to execute specific commands of the legislature. Usually a single officer was placed at the head of each of these departments, until a great variety of minor executives had

arisen, such as the health officer, the factory inspector, the railroad commissioner, and so on.

At the same time, the legislature attempted to enumerate in detail the things that each officer should do and each citizen obey. Two difficulties appeared. The courts often declared their elaborate laws unconstitutional, as being unreasonable, and the executives were restrained from dealing with any specific evil that the legislature had failed to enumerate. These difficulties first appeared in the health department, and the legislatures proceeded to change the character of that department by creating a board of physicians, with power to issue orders based on their expert knowledge, and having the force of law, though not enumerated in the law. Next, in the regulation of railroads, instead of the detailed schedules of rates that characterized the early Granger laws, the legislatures advanced to the position which culminated in the railroad and public utility laws of Wisconsin, of merely declaring (what the courts had already declared) that rates and services should be "reasonable," but creating a commission, with powers of investigation equal to those of the courts, to discover and announce, in each case as it arose, what was the reasonable rate or service. Where the investigations of the courts are limited by the technical rules of testimony, the commission can investigate, on its own initiative and in its own way, all the circumstances that it considers relevant. In fact, the commission is made a kind of standing referee to the court, directed by the legislature to report all of the facts that go to determine what is reasonable. Instead of a referee appointed by the court, usually a lawyer, with the lawyer's limitations as to the relative value of different facts, the commission is a body of men compelled by their duties to give weight to social and economic facts that otherwise do not get before the court.

Wisconsin has now ventured to adopt this same principle in matters of labor legislation. Instead of the long list of dangerous points, such as set screws, belts, fire escapes, dusts, and so forth, which successive legislatures had accumulated during the past 30 years, the new law expresses the general will in the most general way, as the duty of the employer to safeguard the life, health, safety, and welfare of employees and frequenters, and the duty of employees to cooperate with their employers.

The law applies as broadly as possible, not to enumerated factories and shops, but to all "places of employment," except agricultural and domestic employments not using mechanical power. In effect, all physical property used to furnish employment to labor is declared to be "affected by a public use," and must be so managed as to promote the public welfare in the persons of those who come within its zone of danger.

The definition of safety is not that of the "ordinary" safety of the common law, but "such freedom from danger to the life, health, or safety of employees or frequenters as the nature of the employment will reasonably permit." The definition of welfare is "comfort, decency, and moral well-being."

Here, then, is the field of investigation assigned to the commission. It must call to its aid scientific experts in engineering and hygiene. It must ascertain where danger lies and where life, health, safety, and welfare are menaced. It must discover the devices, processes, and management that will avoid these dangers, and must ascertain whether they are practicable. This is that constructive investigation that conforms to reasonableness. Once ascertained and published as an "order" of the commission, the conclusions of its investigations have the force of law, the will of the legislature is executed, and the philosophy of the court is observed.

When the commission began its work of selecting its staff, it had entertained the idea that it should place engineering and medical experts at the head of its safety and sanitation work. But, after interviewing a number of these experts, it was discovered that they considered their problem to be that of drawing up ideal or standard specifications, which the commission should then go out with a "big stick" and compel employers to adopt.

For two reasons this was decided to be impossible. A monarchical country, like Germany, with its executive independent of political changes, might call in its experts and be governed by them, but a democratic country would not consent to be ruled by those whose ideal standards might be removed from the everyday conditions of business. This decision of the commission also conforms to the doctrine of reasonableness, which requires practicability adapted to existing conditions. It was found that most of the successful work in safety and sanitation during the past 10 years had not been in charge of technical engineers, but had been in charge of shopmen or even claim agents of the corporation; and their success had come about not mainly through their knowledge as mechanical experts but through their ability to get the services of engineers and medical men when needed, and especially their ability to get the cooperation of superintendents, foremen, and workmen in a united effort to stop accidents and preserve health. In other words, they were experts in arousing the spirit of "safety first" and in organizing the shop so as to keep that spirit on top. For scarcely a third of the accidents can be prevented merely by mechanical safeguards—at least two-thirds must be prevented by attention, instruction, and discipline.

It is also this spirit of safety among the shopmen that brings out the most effective safeguards—effective in the sense of full protection without interfering with output. The engineer can devise safe-

guards; he needs the shopman to safeguard the output. The "safety expert" is the one who can bring these two elements together and thus work out the practical rules for the commission to adopt. He guides the investigators who determine what is "reasonable," both in the shop and in court. It is for this reason that the Wisconsin commission has not been able to follow the remarkable and extensive safeguards devised and enforced in Germany. They seem to lack that element of "practicability" which the shopman, as distinguished from the technical expert, insists upon.

But in the arrangement finally decided upon the scientist, the engineer, the physician, the sanitarian, who are the technical experts, are called in and utilized just as they are in private employment when their services are needed and when the practical men have problems beyond their technical knowledge. If, however, the scientists dominated the investigations their results, however brilliant and conclusive, might not be reasonable. Their investigations are indispensable and fundamental and must be taken into account and should be liberally provided for. But unless they lead to practicability, which only can be supplied by the practical man, they run the risk of unconstitutionality.

Constructive investigation differs from scientific investigation in that it must be guided toward practical ends under existing conditions. The distinction is vital in America, if not in Europe, for that which is scientific may be unconstituional because not reasonably practical.

But the selection of a proper staff is not enough to insure practicability. The Wisconsin law authorizes the commission to appoint "advisors" without compensation to assist the commission in any of its duties. Acting on this authority the commission invited the Wisconsin Manufacturers' Association and The Merchants' & Manufacturers' Association of Milwaukee as well as other associations of special trades, such as the master bakers, the woodworkers, and so forth, to name representatives; also the State Federation of Labor, the employers' liability insurance companies, and the Mutual Employers' Liability Association, organized on the German model, under the compensation law; and, in addition, the commission invited certain corporations which had done the best safety work in the State to permit their safety experts to meet with the committees.

The commission also secured the assistance of physicians on special subjects of the chief sanitary officers of the cities of Milwaukee and Chicago, of the State board of health, and the State hygienic laboratory, and representatives of the Consumers' League and the State Federation of Women's Clubs. These various representatives were grouped into a main committee on safety and sanitation, with subcommittees on boilers, elevators, bakeries, sanitation, and so on and

deputies of the commission were assigned to work with them. In this way the commission has had the assistance of scientific experts, of representatives of the interests affected by the orders to be issued, of representatives of the public as consumers, of representatives of overlapping agencies, such as insurance companies and boards of health, and of its own experts. This, too, has brought to the commission the assistance of some of the leading men of the State in their several lines of work. These men have given an astonishing amount of time at their own expense, which, if paid for at commercial rates, would have required an expenditure far beyond the appropriation which the legislature allowed to the commission. Such men have looked upon their work, not merely as a public service, but mainly as a vital matter in the future conduct of manufacturing in the State. The list of advisory committees indicates the wide range of representative and expert men to whom the commission and the State are indebted for this fundamental part of its work.

These committees proceed to make their investigations, to draw up tentative rules, and to submit them to the commission for public hearings. After the hearings the rules are referred back to the committee for further investigation and, finally as rapidly as completed, are issued by the commission as "general orders" applying to the entire State and are published in the official paper and in the bulletins of the commission.

The fact that both the law and the commission contemplated the cooperation of employers and employees has resulted in a code of rules which are not only reasonable in law, but reasonable in the minds of employers. It is an application of the well-recognized principle of political economy that the competition of the worst employers tends to drag down the best employers to their level. In this case, however, the corollary law is sought to be brought into play. The most progressive employers in the line of safety and sanitation draw up the law, and the business of the commission is to go out and bring the backward ones up to their level. As a matter of fact, it has been found that the employers on the committees have been more exacting in their search for the highest practicable standards than the representatives of labor on the committees. As a consequence the work of the commission in bringing other employers up to their level has been almost entirely transformed from what they considered an irritating and arbitrary interference in their business into a work of instruction and education. The employer who resists the adoption of safeguards and processes approved by his fellow employers is not only unreasonable in the opinion of his peers, but prima facie unreasonable in court.

DISCUSSION.

EDGAR T. DAVIES, Chicago, Ill.: I shall be glad to be informed by some member of this congress concerning the amount of money appropriated by the various State legislatures for the purpose of enforcing enactments for the prevention and elimination of occupational diseases, and for the promotion of industrial hygiene in general. Take, for instance, the highly responsible duties devolving upon the industrial commission of Wisconsin. What financial support is guaranteed for carrying out these admirable provisions? We, as individual States, have spent large sums of money, and we have accomplished much in reducing the dangers attendant upon hazardous occupations, but in a closer interchange of knowledge concerning what other States are doing lies the possibility of greater accomplishments by means of judicious cooperation.

EFFECTS OF INDUSTRIAL STRAIN ON THE WORKING WOMAN.

ROSALIE SLAUGHTER MORTON, M. D., New York City.

In reviewing the literature on the hygiene of occupation, I have been interested to observe that much of the most able and comprehensive work has been done by women, and also that physicians have given much gratuitous time to an analytical study of this subject.[1]

What has been done shows the great desirability of the appointment, under a National department of Health, of a commission to make a systematic study of industries and their various forms of strain on normal women of different ages and types. Such a study would involve the detailed consideration of modifying factors which are necessary in order that accurate deductions may be made from statistics. For instance, present records show a high percentage of tuberculosis among both men and women working in tobacco. Unquestionably they are affected by the irritation of dust and fumes which render them susceptible to various derangements, especially bronchial catarrh, which lessens their resistance to tuberculosis; but, on the other hand, stripping, sorting leaves, rolling stogies, and so on, is not as strenuous as some other forms of work; so many who already have tuberculosis seek employment in tobacco factories.

The available data on a number of trades show the value to the business and social welfare of the world, as well as to the individual, of wisely conducted industry, for, to become truly constructive to the state, it must be profitable both to the employer and employee.

The regulation of work to an eight-hour day has proved necessary for men, in order that they may retain their efficiency, and such regulation of hours for women is equally necessary. Shorter hours and

fairer pay would lessen the effects of industrial strain upon the working women, both individually and eugenically, to an extent which would raise the health and efficiency of our race at least 70 per cent. Factory and other nondomestic industry is not in itself a menace to women; in fact, in many instances a woman's physical and mental health is better when she is engaged in a regular and impersonal form of work.

Statistics from insane asylums and life-insurance companies show that a higher percentage of insane come from the class of domestics and housewives than from women in trades and professions, and that longevity among women has increased during the last 25 years. Most of the women who break down from work do so from causes which are in no way related to sex. In gathering information for this paper, I found that the average of temporary illnesses in three New York department stores shows that the number of employees who seek relief in the hospitals located in the stores is divided between men and women in about equal ratio to those employed. Of the women patients, approximately one-third suffer from headache, one-third from indigestion and miscellaneous ailments, and only one-third have menstrual disorders, making a very small proportion out of the total number of employees. For instance, in a store which employs 3,000 women, there will average not more than 10 a day who come to the rest room or hospital for a few hours on account of dysmennorrhea. In one of the stores, which employs approximately 3,500 women, the nurse who had been in attendance for 8 years said that she knew of only 15 cases of permanent pelvic trouble brought on by work in the store. In one store, which is situated at the junction of several surface and elevated street car lines, the daily attendance in the store hospital is double that of a store in a more quiet location. The ventilation of the former store is also poorer than in the latter. The proportion of those who suffer from dysmennorrhea is larger in the store which is not so well ventilated and which is noisier, showing that general hygiene has its effect upon a woman's health during her period. A point which is often overlooked when statements are made regarding the endurance of women as a class is that their lower wages do not enable them to purchase such sustaining food as men customarily have. For instance, the average amount paid for their lunch by women in shops, factories, and clerical positions is 15 cents; the average paid by men in the same lines of work is 30 cents. The consequent lack of nutrition in a very short time lessens the endurance of women workers. Among the 3,800 employees in the head office of the Metropolitan Life Insurance Co. absences on account of illness have been conspicuously reduced since the company has provided a substantial lunch for them, and a similar result has followed this wise economic step taken by other employers.

On the general subject of hygiene in relation to industry, many significant deductions may be made which apply to women workers in their homes, in colleges, in professions, in shops, and in factories, showing that their endurance, capacity, and output are influenced by mental and physical hygiene rather than by sex. The papers which have been or will be read before this congress direct intensive thought toward many details of industrial strain which are applicable as much to the working woman as to the working man; in fact, according to the schedules of the Twelfth Census (1900), we find women in 295 out of the 303 separate employments there tabulated. The general headings given are: Agriculture, professional service, domestic and personal service, trade and transportation, manufacturing and mechanical pursuits. The eight employments in which no women are recorded are: Soldiers of the United States, (2) sailors of the United States, and (3) marines of the United States, (4) street car drivers (though two women are reported as motormen), (5) firemen (in the fire department), (6) apprentices and helpers to roofers and slaters, (7) helpers to steam boiler makers, and (8) helpers to brass workers.

It may be of passing interest and, perhaps, a surprise to note that a limited number of women were registered in unusual occupations; 5 women were employed as pilots on steam railroads, 5 as baggagemen, 31 as brakemen, 7 as conductors, 35 as engineers and firemen, and 26 as switchmen, yardmen, and flagmen; 6 women were reported as ship's carpenters, and as many as 181 were reported as blacksmiths, and 508 as machinists; 8 as boiler makers, 31 as charcoal, coke, and lime burners, and 11 as well borers.

The laws, or lack of them, for the protection of women's health and the occupations in which women suffer from lack of fresh air or proper light, too great heat or cold, speeding up, inhalation of irritating dust and gases, et cetera, and the effects of these various forms of industry, have been so comprehensively presented to you that anything I might say would be in large part a repetition; therefore, I will confine my paper to the especial effect upon women of trades which involve prolonged and unnecessary standing, the pushing of heavy trucks from room to room, as in the larger canneries; the constant carrying of heavy weights, as core makers in foundries, who carry trays of sand cores weighing from 10 to 50 pounds from work benches to ovens; or operating machinery by treadle pressure, with incessant kicking, as in a case cited by Dr. Caroline Hedger, where, in assembling screw drivers, a girl kicked 7,000 times a day with one foot. Violent treadle pressure, as in button-stamping machines, perforating presses in binderies, and the laundry cuff press, is especially harmful to women.

In order to push or carry a heavy weight it is necessary to forcibly inflate the lungs and rigidly fix the diaphragm. This increases inter-

abdominal tension, and will eventually lead to prolapsus, anteversion, anteflexion, retroversion, or retroflexion of the uterus. The fatigue consequent upon continuous heavy muscular effort causes a relaxation of the ligaments which support the uterus, and, as the organ is situated in the pelvis with the heavy end up, when the ligaments lack tone, the force of gravity tends toward misplacement. Normally the uterus is well balanced by the round and the broad ligaments on each side, the sacro-uterine behind, and the vesico-uterine ligaments in front, and is to some extent supported by the vagina.

According to the investigation of Elizabeth Beardsley Butler, in Pittsburgh, in 1907–8, prolonged standing as customary in most departments of cracker factories, laundries, dyeing and cleaning establishments, metal works, lamp and glass factories, mirror, broom, cork, paper box, soap, and trunk factories, in some pressrooms, and in most mercantile houses. This standing for long hours may tend toward uterine misplacements, as indicated above. Then, too, the fatigue of the nerves of the back bears directly upon the uterine nerve supply, which is derived from the second, third, and fourth sacro-spinal nerves, and from branches of the hypogastric (sympethetic) plexus, this not only causes local but reflex symptoms which impair the functions of other parts of the body. The numerous occupations which, on the other hand, require the employee to be seated for hours in one position have an especially deleterious effect upon a woman's health by tending to overfull bladder, constipation, and pelvic congestion. The uterus is placed between the bladder and the lower end of the large intestine which passes above and back of the uterus, and the straining caused by difficult defecation produces at least 50 per cent of downward misplacement of the uterus, with all its attendant discomfort, and the frequent necessity of spending several weeks in a hospital. Constant overloading of the rectum causes pressure on many of the 28 blood vessels in the pelvis and interferes with the return of venous blood, thereby causing congestion and possible inflammation of the ovaries, Fallopian tubes, uterus, and vagina, which means ofttimes invalidism, sterility, habitual miscarriages, or lifelong misery.

Dr. Ely Van der Warker has called attention to the fact that the shape of the knee, the shallowness of the pelvis, and the delicate construction of the foot of a woman render her inadequate for continuous standing for 8 or 10 hours. He calls attention to the "smallness of the patella and the narrowness of the articular surfaces of the tibia and femur. The lateral prominences of both bones are more developed in man, and therefore his knee joint helps to form a more perfect sustaining column. In a woman the muscles which keep the body fixed upon the thighs in the erect position labor under the disadvantage of shortness of purchase owing to the short dis-

tance, compared to that of a man, between the crest of the ilium and the greater trochanter of the femur, thus giving to men a much larger purchase in the leverage existing between the trunk and the extremities; and, comparatively, the woman's foot is less able to sustain weight than the man's, owing to its shortness and the more delicate formation of the tarsal and metatarsal bones." It must, however, be borne in mind that this is somewhat offset by the fact that the average weight of a woman's body is less than the average weight of a man's, and that the feet of European and American women have increased in size with their greater use.

One of the primary drawbacks for women in the industrial life of to-day is that most factories are equipped for the convenience of men workers. Mrs. Florence Kelly called my attention to the use in one instance of tables designed for men to sit at them, and used by girls 14 years old, who are thus quite needlessly obliged to stand.

Prolonged standing and excessive use of the legs, as in the manipulation of the treadle machines, has an effect upon the bones of the pelvis, particularly in poorly nourished women between the ages of 14 and 25, as the bones are then not sufficiently hard to resist the mechanical effects of the extreme pressure. The pelvis forms a bony girdle which supports the weight of the rest of the body and is itself supported by the legs, the heads of the femurs fitting into the acetabuli, the concave sockets on each side of the pelvis. Constant standing causes this pressure to symmetrically narrow the pelvis. The incessant use of one limb may cause a lateral deformity which will render difficult or impossible an erect position of the body, upon which depends to a large extent the health of every organ, because unless the lungs have sufficient room to expand they can not aerate the blood, and therefore a large portion of the waste products of the body is not eliminated, and oxygen is not supplied to the tissues of the body. All occupations which cause the workers to become round-shouldered are fundamentally injurious, because the space for each organ in the body is so apportioned that the encroachment of one organ, or set of organs, upon others (as from faulty position of the bony structure) interferes with the function of the organ pressed upon. The especial menace of any pelvic deformity is in its relation to pregnancy. Any narrowing of the pelvis interferes with development of the child in utero and may necessitate an instrumental delivery, with the attendant risk of serious injury to both mother and child.

The health and vitality of the child from the time of conception depend very much upon the mother's physical condition; an unhealthy condition of her tissues may prevent a proper development and implantation of the placenta. A large number of miscarriages are due to this cause, and later, if she is overworked and poorly

nourished, the nourishment of the child will be very much interfered with during gestation and lactation.

In a symposium on sex problems in relation to the health of working women it would not be right to omit mention of two very important factors which greatly reduce their health ratio, although these diseases are not due to industrial strain, and indeed the women themselves are often ignorant of having acquired them. Their working efficiency is frequently reduced as a result of their suffering from syphilis and gonorrhea, and the economic effect of this is far-reaching. The placenta, under ordinary circumstances, acts as a filter and prevents the transmission of disease; for instance, a child of a tubercular mother is not born with tuberculosis, but a child may inherit syphilis from its mother or father. Unfortunately, a large number of working women suffer from syphilis and gonorrhea, of the presence of which they are ignorant, and for which they therefore do not seek diagnosis and treatment.

In connection with the physical efficiency of women a study of women athletes was made in 1884 by Dr. Sarah E. Post, and one recently made by Dr. Angenette Parry is interesting. She found that a bareback rider, 35 years old, who while performing jumps through a hoop at the rate of six times a minute, in one pregnancy rode until the eighth month, and a normal child weighing 9 pounds was born at term. In another pregnancy she also rode until the eighth month, and began riding again four weeks after the birth of this her fourth child. The woman is in perfect physical condition.

Another rider continued to ride until the eighth month, and later nursed her child. These women, when asked whether they were exceptional cases, said no one ever heard of anyone breaking down in the business. Another, who was also the mother of a rider, had six children living. A trapeze performer, 25 years old, has regular menstruation and no pain. The flow stops while she is performing.

A hippodrome acrobat; tumbler; hand balancer; 27 years old; began training at 5 years; trapeze and rings; first menstruation at 12; always regular; 5 days; moderate flow; no nausea or vomiting; no cramps; occasional headache; flow does not stop while performing. Married at 20; first pregnancy; performed until fifth month; very easy labor—12 hours; second pregnancy, very easy labor—half an hour; after three months went back to the stage; plenty of milk.

Mrs. Hosfall; father an American, mother an Indian; educated by missionaries in summer; the rest of the year followed the band of Indians; married at 20; trapped with husband; poles, tracks boat, handles ax, builds cabin, shoots, hunts, cooks; skillful in Indian woman's practical work, dressing animals, tanning, and so forth. Four healthy daughters in five years; two youngest each born on the bank of the river, with the temperature many degrees below zero,

where she was entirely alone and must keep fire and cook; passed successfully through it all.

Dr. Parry pointed out that these women wore no heavy skirts; that their training began in childhood; and that they undoubtedly have unusually strong uterine ligaments; they are very careful of personal hygiene and have plenty of air, wholesome food, and work which they enjoy. A young woman recently swam across San Francisco Harbor, a distance of 8 miles, and on arrival was not fatigued. The feat had been accomplished but twice before. These are exceptional cases and not especially to be recommended, for in both men and women an overtaxed dilated heart often results in fatty degeneration of the heart and muscles and generally follows a discontinuance of vigorous athletics. Moderate regular exercise is necessary for continued good health, and the normal woman can attend to her ordinary duties during her menstrual period without injury, although on account of the uterus being physiologically heavy at that time, overexercise and vigorous exercise should be avoided the first three days of the period.

Much has been said and written about nervous strain in women's work, and there are some occupations, especially that of telephone operators (as pointed out in the investigation of telephone companies, in Senate document 380), which call the special senses into play in a manner in which they are required to act not only continually but concertedly. This feature calls for special consideration in estimating the strain to which telephone operators are subjected by the nature of their work. As has been pointed out, connections on a switchboard are made by inserting a small plug in a small hole above which the number of the telephone requested appears. The eye is attracted in the first instance by the glowing of a light which announces the call. It has then to immediately find on the switchboard the hole in which it is necessary to insert the plug to make the desired connection. Similarly in disconnecting, the eye detects the extinction of the light, and then seeks on the switchboard the number with which the connection has been made. This means constant employment of the muscles of the eye in different directions and constant use of the optic nerve. The ear, in receiving calls, is required to distinguish between a multitude of different voices to ascertain at once, in order to avoid repetition, the number asked for, no matter how indistinctly or ill pronounced the number may be. This necessitates constant alertness of the auditory nerve, while the vocal organs are scarcely less constantly in use in the answer of calls, the repetition of numbers, and the conduct of such conversations as may be necessary. The sensations created by the operation of the several senses in this manner transmit their several messages

to the brain, which, in turn, directs and governs the actions they suggest.

These special senses are simultaneously called into play also in stenography, typewriting, and telegraphy, but to a less extent than in telephone operating. These forms of work are psychologically and physically well adapted to women, but hours of employment should be shorter than in other forms of work which are less expert and taxing to the nervous system. The report of the Royal Commission of Canada on telephone companies presents a study of special value.

The increase of nervous prostration among both men and women is perhaps the most important effect of strain which we have to consider, for all muscular and intellectual effort requires the expenditure of nervous energy, and overlong working hours wholly exhaust the sources of nerve endurance. Nerve cells are the producers of energy, and nerve fibers conduct this to the muscles. Stimulation is wholesome; overstimulation produces accumulations of waste products, which act as a definite poison, and demonstrable changes take place in the cells of the brain and spinal cord. Miss Josephine Goldmark has compiled much valuable data in her book on "Fatigue and Efficiency," which forms an unanswerable argument for shorter hours of work for both women and men.

The measure of pleasure one finds in work markedly affects the amount of strain, as is well illustrated by the fact that work which well accomplishes its object is less fatiguing than the same amount of energy spent on work in which one is not interested or which results in failure. The training of women in salesmanship by Mrs. Lucinda W. Prince in the Woman's Educational and Industrial Union, in Boston, shows the value of so educating woman that her brain and physical force may work together, giving her a sense of responsibility in regarding her work as a vocation, with intelligent interest in system, attention to details, increased knowledge of the goods to be sold, color, design, textiles, and so forth. Pupils sent from five well-known Boston department stores receive full wages while taking the three months' course, which occupies them each morning. The value of this as a business proposition, as well as an illustration of the increase in efficiency with the lessening of strain, is shown by the fact that their afternoon sales give them a weekly total as high as the employees who do not attend the school and who work all day.

In summarizing the direct effects of industrial strain on the working woman, it is my opinion, after consulting statistics compiled by many investigators, boards, institutions, companies, colleges, and others, and also after conferring with a number of thoughtful people who have opportunities to observe women who work under varied conditions, that, with properly regulated hours of work and recreation, outside of the excessive physical labor to which I have referred

in this paper, women may work in practically any field of modern industry, and not only retain but increase their standard of health. But they must be given hygienic and properly arranged buildings in which to work and they and their employers taught the common sense of the laws of health. This education is the great need. For when legislatures and their constituents really comprehend that the health of its citizens is the greatest asset of any nation, they must pass laws protecting the health of laborers, and this will occur when a greater number of their constituents are interested in the health of women of all classes.

Without education, good laws may be inactive. For instance, in six States—Massachusetts, Maryland, California, Wisconsin, Illinois, and New York—we have laws providing seats behind the counter for saleswomen, which, however, they are prevented from using by the disapproving watchfulness of a floorwalker who is ignorant of the relation of fatigue to inefficiency.

When individuals are educated to understand that their happiness and continued usefulness depend upon personal as well as industrial hygiene, there will be a fullness of joy in living which is a perfectly practical standard for the attainment of which the world's best citizens are working.

REFERENCES.

Butler, Elizabeth B.—Women and the Trades. Pages 358–367: Health conditions among women workers.

Jacobi, A. (M. D.).—The Physical Cost of Women's Work. (Charities and the Commons, 1907, v. 17, pp. 839–844. Overwork of women and its effect on their health.)

Klink, Jane S.—The Health of Women Workers. (Academy of Political Science, N. Y., vol. 2, No. 2, pp. 35–40.)

Massachusetts Bureau of Statistics of Labor.—Female Health, Special Effects of Certain Forms of Employment Upon. Sixth annual report, 1875, II, pp. 67–112. Published also by physician who made investigation. Ames, Azel, jr. Sex in Industry; a plea for the working girl. Boston, Osgood, 1875, 158 pp.

United States Labor Bureau.—Report on Condition of Women and Child Wage Earners in the United States, 1910–1912.

Fourth Annual Report of United States Commissioner of Labor, 1888.—Working Women in Large Cities; conditions of health.

Wright, Carroll D.—Effect of Work on Health. The working girls of Boston, Mass., pp. 68–75. Fifteenth annual report of Massachusetts Bureau of Statistics of Labor, 1884.

Special report of the Census Office.—Statistics of women at work.

American Labor Legislation Review.—Industrial diseases.

Smart, Isabelle T. (M. D.).—The Question of Heavy Apparatus Work for Women.

Senate investigations of telephone companies, 1910.—Health of Women Employees; pp. 20, 76, 82, 105, 108, 109.

Publication 12 of the American Association for Labor Legislation.—Occupational Diseases.

Dana, Charles L. (M. D.).—Occupational Neuroses, in Medical Record, March 9, 1912.

Abbott, Edith.—Women in Industry.
Kober, George M. (M. D.).—Industrial and Personal Hygiene.
Appeal from the Circuit Court of Cook County.—Legislation limiting hours of labor.
Bulkely, L. Duncan (M. D.).—The Place of Women in the Modern Business World, as Affecting Health. Bulletin of American Academy of Medicine, page 342.
Kellor, Frances A.—Experimental Sociology, page 86: Occupations.
Goldmark, Josephine.—Fatigue and Efficiency. Charities Publishing Company, N. Y., 1912, page 890. Physical effects of overstrain on women workers.
Hedger, Caroline (M. D.).—Relation of Infant Mortality to the Occupation and Long Hours of Work of Women. Bulletin of the American Academy of Medicine, Easton, Pa., 1910, v. 11, pp. 80–89.
Van Kleeck.—Working Hours of Women in Factories (Charities, New York, 1906–7, v. 17, pp. 13–21). Result of long hours and overwork on physical condition of working women.
Fourth Annual Report of United States Commissioner of Labor, 1888.—Working Women in Large Cities.
Macy, Mary Sutton (M. D.).—The Industrial Occupations of Women in Relation to Infant Morbidity and Mortality.
Smart, Isabelle T. (M. D.).—Relation of Women in Industry to Child Welfare. Woman's Medical Journal, March, 1911.
Saleeby, C. W.—Woman and Womanhood.
Kelley, Florence.—The Sex Problem in Industrial Hygiene. American Journal of Public Hygiene, Boston, June, 1910, v. 20, pp. 252–257. Plea for legal regulations of hours of labor for women.
Birmingham, England, health department.—Industrial Employment of Married Women and Infant Mortality.
Spencer, Anna Garlin.—Social Use of the Postgraduate Mother. The Forum.
Launching of the Child. Outlook, 101; 75–80.
Physiological Basis for Education. Nineteenth Century, 71; 945–65.
Infant Welfare. Am. Journal Soc.
Report of the United States Department of Labor on the condition of woman and child wage earners, Vol. XIII.
Origin and Control of Mental Defectives. Pop. Sci. Mon., 80; 87.
Woman and the Wage Question. Rev. of Rev., 45: 439–42. Same, 45: 226–28.
Efficiency in Child Saving. Am. Acad. of Med., 41; 69–70.
Conservation of Womanhood and Childhood. Outlook, 99; 1013–9.
Woman in Industry, Atlan. Monthly, 110; 116–24.
Woman and Child Wage Earners in the United States. Am. Econ. Rev.
Scrub Woman of the Financial District. Survey, 28; 414–6.
Revelations of Industrial Life. Liv. Age., 274; 138–47.
Legislative Gains for Woman. Survey, 28; 95–7.
Forsythe.—Children in Health and Disease.
Gorst, Sir John.—The Children of the Nation.
Saleeby.—Parenthood and Race Culture.
Oliver, Thomas.—Dangerous Trades.
Parry, Augenette (M. D.).—Relation of Athletics to the Reproductive Life of Women. Amer. Jour. of Obstr., Sept., 1912.
Statistics of Women at Work. Government Printing Office, Washington, D. C.
Mosso, A., professor of physiology, University of Turin.—Fatigue.
Forel, Dr. A.—Hygiene of the Nerves in Health and Disease.
Post, Sarah E. (M. D.), Medical Record, May 17, 1884.—Exercise for Women as Illustrated in Circus Riders and Gymnasts.

[1] See appended list of references.

INFANT MORTALITY IN RELATION TO FACTORY LABOR.

GEORGE REID, M. D., D. P. H., county medical officer, Staffordshire, England.

Among the contributory causes of excessive infantile mortality it is difficult to assign to each its relative share in the sum total. It has been conclusively proved, however, that to improper feeding, the result of ignorance, poverty, or adverse domestic circumstances, must be given a prominent place among the factors, and it follows that causes which tend to increase the number of artificially fed infants in a community must increase the rate of mortality, unless the causes in question incidentally improve the chances of survival in other respects, and so wipe out the effect of the added risk attributable to improper feeding.

Applying this argument to artisan communities similarly circumstanced as regards domestic and hygienic conditions generally, but differing in respect of the facilities which the trade of the district affords for women employment, which takes mothers away from their homes in the daytime, and thus adds to the proportion of artificially fed infants, one would expect to find that the infantile mortality in the latter group would exceed that in the former. It so happens that in Staffordshire we have large artisan populations, all equally favorably situated as regards domestic circumstances and not differing in their hygienic surroundings, but presenting a wide difference in the facilities afforded for the employment of women in factories and works.

Broadly speaking, the artisan towns of Staffordshire are grouped together and constitute two large populous centers in the extreme north and south of the county. In the northern group, embracing the pottery towns, many married women are employed in factories, whereas in the southern group, where the artisan classes are engaged mostly in iron works and collieries, such employment is less common. When I first was connected with the public-health work of the county, year by year, as the mortality returns reached me, I was struck by the greatly increased infantile mortality figures in the northern as compared with the southern towns, and, as I was unable to attribute this to differing circumstances as regards prosperity of the populations or their hygienic surroundings, I determined to classify the towns more strictly in accordance with the proportion of married women employed in factory work, disregarding their geographical position, and so make more acutely obvious the effect of such employment on the infantile mortality, supposing that to be the chief factor in operation in the towns in question. To enable this to be done the registrar general was good enough to supply me with the needful data, and in the following table figures are given showing the infantile mortality for three decennial periods in the

artisan towns in question, irrespective of position, but grouped according to the number of married and widowed working females in relation to female population between 18 and 50 years as disclosed by the 1901 census.

Had it been possible to work out the rates in each case on the married female population only, the percentages would of course have been higher, but I had no data to allow of this being done. Again, I was obliged to assume, in the absence of corresponding figures from previous census returns, that the number of married and widowed outworkers to the female population within the specified age limit was the same throughout the 30 years covered by the infantile mortality figures, as in 1901, an assumption which, I think, is justified by the fact that no change has taken place in the special trades carried on in the various towns during the whole period.

Class according to percentage of married and widowed workers to female population between 18 and 50 years.	Number of towns.	Total population, 1901 census.	Deaths of infants under 1 year per 1,000 registered births.		
			1881–1890	1891–1900	1901–1909
I. 12 per cent and over	5	132,299	195	212	18
II. Under 12 per cent and over 6 per cent	13	263,868	165	175	152
III. Under 6 per cent	8	131,503	156	168	139

It will be seen from these figures that, while the mean rate for the last period has been considerably lower in each group than in the previous two decennial periods, practically the same relative proportion has been maintained in the three groups.

At the request of the Home Office I recently conducted a special inquiry into the effect on infant mortality of the employment of married women in factories.

The inquiry was confined to the six pottery towns—namely, Hanley, Stoke-upon-Trent, Tunstall, Burslem, Longton, and Fenton—the object being to determine with greater accuracy than had been possible hitherto the effect of home conditions, and especially the influence of factory employment, upon infant mortality. With this object in view particulars regarding the 12 months' history of infants born among artisan families in 1908 were noted, the information being obtained by four experienced ladies who were specially appointed for the purpose and who from day to day, for a period of about five months, visited the families to obtain answers to a comprehensive schedule of questions. We thus succeeded in obtaining the desired particulars relating to 4,275 infants born in the year in question, and from the schedules summary sheets were prepared on a prearranged plan for the convenience of the Home Office officials.

In the following table the figures of infantile mortality in the two groups of families are shown:

Class.	Number of births in 1908.	Deaths under 1 year.	Deaths under one year per 1,000 births.
Home mothers	3,150	462	146
Mothers working in factories or away from home during the day	1,125	236	209

It will thus be seen that the death rate among infants of mothers who leave their homes during the day to engage in work in factories or elsewhere exceeds that among infants of home mothers by 43 per cent. I have always contended that this result is attributable to the fact that among the home-mother class a larger proportion of the infants are naturally fed and thus have a better chance of survival than the infants of the other class, most of whom are artificially fed.

Hitherto I have not been able to obtain reliable data showing the relative death rate among breast-fed and artificially fed infants in Staffordshire, but, thanks to the Home Office inquiry, figures relating to artisan families in the six pottery towns are now available, from which I have prepared the following table. For the purpose of this table I have selected those infants only who were alive one month after birth, because, contrary to my expectation, practically all the factory mothers suckled their infants during the four weeks they were compelled by law to remain at home after their confinements, while most of the other outworking mothers were at home for at least two or three weeks after their confinements. For the purpose of grouping, as regards feeding, I have included among the wholly breast fed only those infants who were so fed for three months and upwards:

Incidence of mortality among infants who survived the first month of life, classified according to nature of food.

	Breast wholly.	Breast partly.	Artificially wholly.
Number surviving first month	2,429	932	457
Number of those dying under one year	235	162	114
Deaths under one year per 1,000 infants who survived first month	97	174	249
Percentage increase over breast fed		79	157

I am aware that in certain large towns—Birmingham, for example, where similar inquiries have been conducted—the fact of mothers working in factories does not seem to increase the infant death rate, and the suggested explanation is probably the right one—namely, that the increased earnings from such work enable the families in question to live under better home conditions as regards food, clothing, and so forth, and by counteracting the injurious effect of poverty, balance the injury arising from the increased porportion of artificially fed infants. Among the families in the pottery towns included in the inquiry, however, poverty was conspicuously absent, and the

standard as regards home conditions was remarkably uniform, so that the evil effect of injudicious artificial feeding was not obscured by other compensating influences.

Dr. Robertson, the medical officer of health of Birmingham, in commenting upon the fact that the result of the inquiry in that town did not show that the employment of married women away from home had an adverse influence on the infantile mortality, pointed out that all the families embraced in the inquiry belonged to the very poor class, and that in all probability the money earned by the working mothers provided the means of relatively improved living, and thus counteracted the effect which otherwise might have been produced by the deprivation of mother's milk. As I have stated, the inquiry I conducted in Staffordshire was confined to well-to-do artisan families, and the mothers who engaged in factory work did so from inclination, not necessity.

The Home Office inquiry was a very comprehensive one and the facts ascertained had reference to all influences bearing upon infantile mortality in relation to factory labor. In the pottery towns of Staffordshire, for example, it embraced the effect on the miscarriage and stillbirth rates of working in lead, and from the returns I have compiled the following table, in which the rates have been corrected for period of married life, the mean period being 8.9 years:

	Number of records.	Percentage of mothers having—			Number per 100 mothers.		
		Miscarriages.	Stillbirths.	Miscarriages and stillbirths.	Miscarriages.	Stillbirths.	Miscarriages and stillbirths.
Housework	2,812	16.0	10.6	24.0	27.2	14.8	43.2
Factory and other workers (not in lead)	984	9.2	8.4	16.4	26.6	21.0	47.6
Mother:							
Lead worker previous to marriage	121	25.6	6.6	30.6	74.2	11.8	86.0
Lead worker since marriage	70	30.0	14.3	37.1	99.0	32.8	133.5
Father: Lead worker	148	16.9	7.4	22.9	35.5	11.8	48.0

It is to be regretted that the figures relating to lead workers are relatively so small, but no selection of families was made; and it so happens that among those inquired into as having had children born during 1908 only the number stated chanced to be lead workers. Small though the numbers are, however, they are very significant; and I do not think that the suggestion they convey, that mothers who work in lead are three times more liable to have miscarriages and stillbirths than other mothers, can be entirely discredited because of possible statistical error. Granting that the figures may be relied upon, it would appear that working in lead before marriage, although not afterwards, also conduces in lesser degree to an increased miscarriage and stillbirth rate.

INFANT MORTALITY IN RELATION TO FACTORY LABOR.

JOHN ROBERTSON, M. D., B. Sc., medical officer of health, Birmingham, England.

It is probable that all will agree that the child of a mother who is engaged in factory labor, both before and after her confinement, does not, and never can have, as good a chance of survival as that of the mother who can, during pregnancy and lactation, do what she wishes for herself and her infant. The experience of every country is that among the poorer classes those children who are breast fed have a better chance of survival than those who are artificially fed. Statistics amply justify this everywhere. It is indeed inconceivable that the home of the mother who has to work in a factory for many hours daily can be as well cared for as that of the mother whose whole energy, time, and interest are spent on it.

The real question resolves itself into whether the mother who goes out to the factory because the household income is small, is doing something which enables that household to keep above the poverty line. In other words, is it better for these mothers to go to work, notwithstanding some damage to the infants, or to stay at home and receive the damage done by poverty? Does factory labor do as much harm to mother and child as poverty? Which is the greater evil?

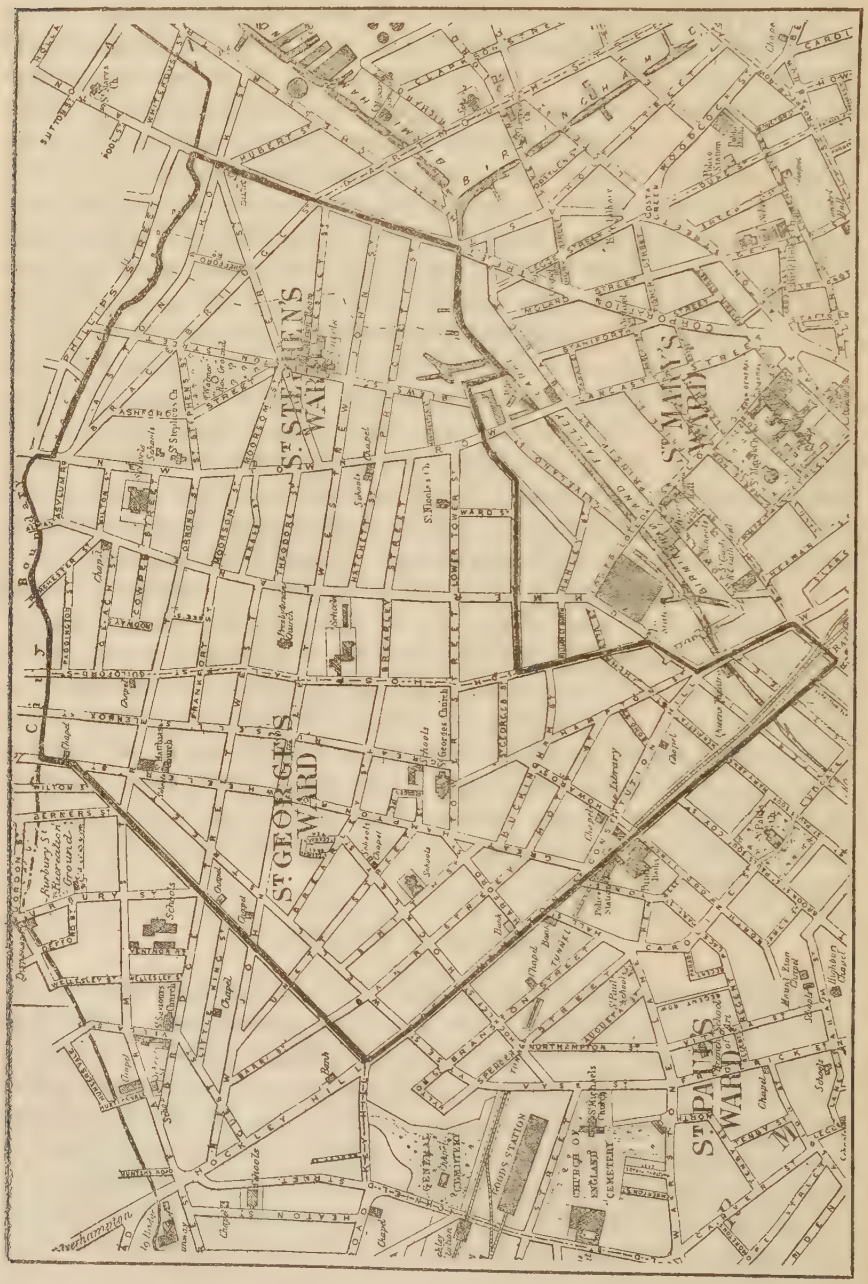
To test this question, I would bring forward the statistics I have accumulated in an area of the city of Birmingham, where approximately 50 per cent of the married women are employed during childbearing years, while the other 50 per cent are of very much the same class, but do not work in factories. In so far as these statistics relate to a district where the whole population is what might be called a "very poor working class one," they differ from those relating to areas where the poorer women alone go to work, while many of those who do not go to work are of a different social status, and therefore not comparable.

DESCRIPTION OF THE AREA.

All the mothers and infants lived in a well-defined area in the poorest part of Birmingham, shown on the appended map. The area is peopled largely by unskilled artisans with low wages. The dwellings consist of small cottages, often rather crowded together, and varying from 60 to 100 years old. In the area are many factories and workshops, most of these being engaged in the manufacture of light metal fittings, such as brass work, cycle parts, and such like.

The area is 289 acres in extent. The estimated population in 1908 was 41,884. The mean death rate was 22.5 per thousand, while that

for the whole city is under 15 per thousand. The infantile mortality rate has varied from 150 to 232 per thousand infants born. The



density of population per acre in St. Stephens ward was 132.7, and in St. Georges was 162.1.

The percentage of married women employed is approximately 53 per cent. In the whole city of Birmingham it is 19 per cent. For such an investigation as the present the district is an excellent one.

HOW THE OBSERVATIONS WERE MADE.

Dr. Jessie Duncan, with two lady health visitors, were appointed by the health committee of Birmingham to carry out, under my direction, an inquiry on the influence of employment on the mother and her infant. They have dealt with every birth occurring in the area and those occurring in institutions coming from this area.

Weekly or monthly visits were made to the homes after the birth of a child, and frequent weighings of the infants were made in most cases.

During the four years, 1908 to 1911, inclusive, 5,993 infants were born. Of these, 5,898 were legitimate, i. e., the rate of illegitimacy was 15.9 per thousand, an exceptionally low rate.

Of the 5,993 confinements, 1,182 were attended by a medical practitioner, 4,357 were attended by a midwife, and 454 were confined in institutions or were unattended.

Of the 5,993 births, 159 were stillborn, and 250 died within one month of birth.

Only 137 infants were born in homes which were of a class distinctly better (shopkeepers, and the like), so that the 5,856 infants and mothers dealt with in this paper were, from their home circumstances and surroundings, strictly comparable.

Employment and premature birth.

	Mothers.	Premature births.	Rate per thousand.
Mothers employed before confinement	2,966	156	52
Mothers not employed before confinement	3,255	125	38

Factory labor, then, has a distinct influence in causing premature birth.

Morality among infants under one year per thousand births.

	Infant mortality rate.		
	1908	1909	1910
Mothers employed in factory	186	194	168
Mothers employed elsewhere	200	147	123
Total employed	190	179	153
Total not employed	207	169	161

It will be noticed that in 1908 and 1910 the rate of infant mortality was greater among women not employed than among employed.

Of the infants kept under observation one observer recorded her opinion as to the health of the child at 12 months of age, and the results are as follows:

	Condition of infant at 12 months.					
	Good health.		Fair health.		Poor health.	
	1909	1910	1909	1910	1909	1910
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Mothers employed	57	59	28	29	15	12
Mothers not employed	63	69	24	23	13	8

This shows that a larger percentage of infants of mothers not employed than of those of mothers employed were at the end of 12 months in good health.

The balance is distinctly in favor of the unemployed mothers' infants.

The employment of mothers was so varied that no useful classification could be made which would enable us to arrive at the influence of hard, as distinguished from light, work in the production of unwholesome conditions.

The women who worked in factories were largely employed in power-press or hand-press work, polishing metals, and grinding light articles.

AGE OF MOTHER IN EMPLOYMENT.

A large number of employed mothers were under 30 with small families, apparently indicating that when the family is large the mother is unable to leave home. This fact has a considerable influence on the statistics of death and ill health. We have found that the mortality among infants of young mothers, whether employed or unemployed, is greater than among those of older mothers.

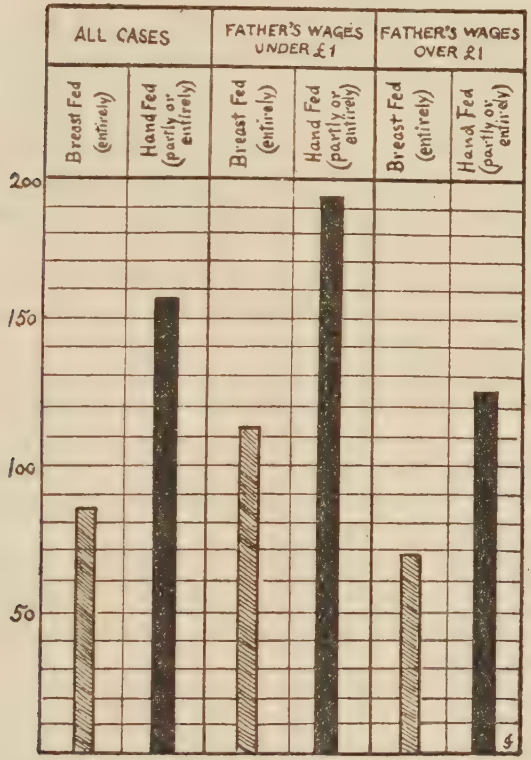
Poverty has a greater influence on the infant than factory labor.

	Father out of work or earning less than £1 per week.		Father earning £1 per week or over.	
	Infantile mortality rate.		Infantile mortality rate.	
	1910	1909	1910	1909
Mother employed in factory	203	235	123	146
Employed at home or elsewhere	187	176	53	120
Total employed	198	217	99	137
Not employed	191	199	150	154
Total	196	211	127	146

This shows that the mortality is 50 per cent more in the case of mothers in poverty than in those not in poverty.

In the following diagram the great influence of poverty is shown, as well as the influence of artificial feeding in producing infant mortality:

INFANT MORTALITY IN RELATION TO FEEDING AND POVERTY.



Employment of mother and weight of infant at 12 months.

	Father out of work or earning less than £1.		Father earning £1 or more.	
	1910	1909	1910	1909
Mother employed in a factory	17¾	17½	18¼	18¼
Employed at home or elsewhere	17½	17¾	18¼	18¼
Employed	17¼	17½	18½	18¼
Not employed	18	17⅔	19	18⅔

It will be noted from this table and from the charts that both employment and poverty influence the weight of the infant at 12 months, but of these poverty is overwhelmingly the greater influence.

The nutritive value of the human milk given to infants was carefully estimated, both in women above and below the poverty line, and in those employed and not employed.

Numerous samples were obtained from each mother, and on these the following observations are based:

It was soon evident that factors over which there was apparently no control influenced the amount and quality of the milk.

The whole of the milk contained in one breast was drawn off and a portion taken to the city analyst for analysis. Careful note was made as to the time since the last emptying of the breast.

By means of a breast pump it was not possible to get out as much as the infant was proved to get by careful weighing before and after its meal. The amount varied in 136 observations from 7 to 147 cubic centimeters.

The amount increased with the period of lactation from an average of 49.7 cubic centimeters during the first month to 114.6 cubic centimeters at 9 to 12 months.

The average quantity obtained was 34 cubic centimeters after a two hours' interval and 48.5 cubic centimeters after a five or six hours' interval.

The proteid varied from 0.7 to 1.9 per cent, lactose from 6.6 to 7.6 per cent, ash from 0.2 to 0.3 per cent, solids not fat from 7.7 to 9.3 per cent, fat from 0.7 to 5.7 per cent.

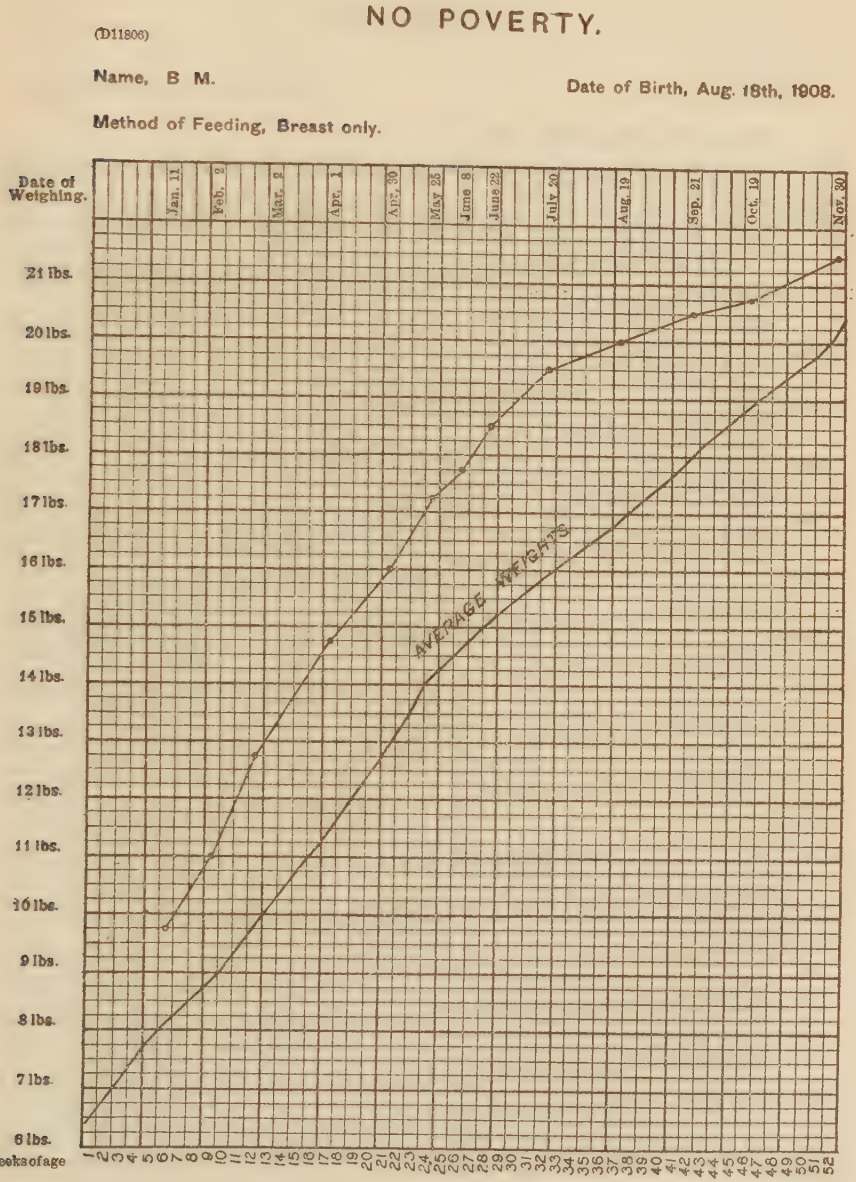
None of these variations appeared to be dependent either on the employment of the mother or on her poverty. Indeed, some of the rich milks were obtained from mothers who were obviously in a condition of starvation.

CONCLUSIONS.

In the special area under review there appears to be no doubt about the prejudicial influence of employment of pregnant and nursing mothers in factories, both on their infants and on themselves.

Poverty has, however, a much more deleterious influence; and if by employment poverty can be removed or lessened, such employment is the lesser by far of two evils.

Inspection of the homes of women who have to be at factories all day clearly indicates that the removal of the mother gives rise to many conditions of dirtiness or irregular or bad nourishment of infants, which must obviously be prejudicial. It is perhaps fair to many of these women to record how well they carry on their home duties under the very difficult circumstances in which they are placed. Many breast-feed their infants at the factories and keep their homes extremely clean.

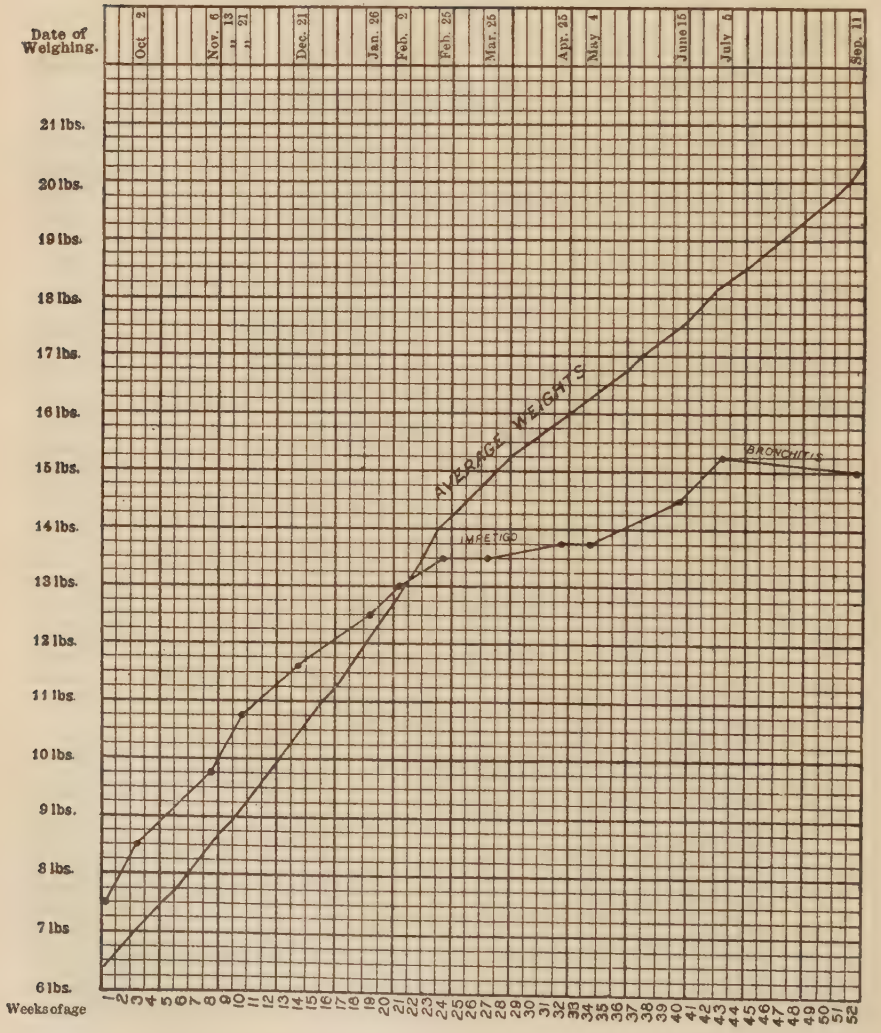

NO POVERTY.
(D11806)
Name, B M.
Date of Birth, Aug. 18th, 1908.
Method of Feeding, Breast only.
Date of Weighing.
Jan. 11
Feb. 2
Mar. 2
Apr. 1
Apr. 30
May 25
June 8
June 22
July 20
Aug. 19
Sep. 21
Oct. 19
Nov. 30
21 lbs.
20 lbs.
19 lbs.
18 lbs.
17 lbs.
16 lbs.
15 lbs.
14 lbs.
13 lbs.
12 lbs.
11 lbs.
10 lbs.
9 lbs.
8 lbs.
7 lbs.
6 lbs.
AVERAGE WEIGHTS
Weeks of age
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52

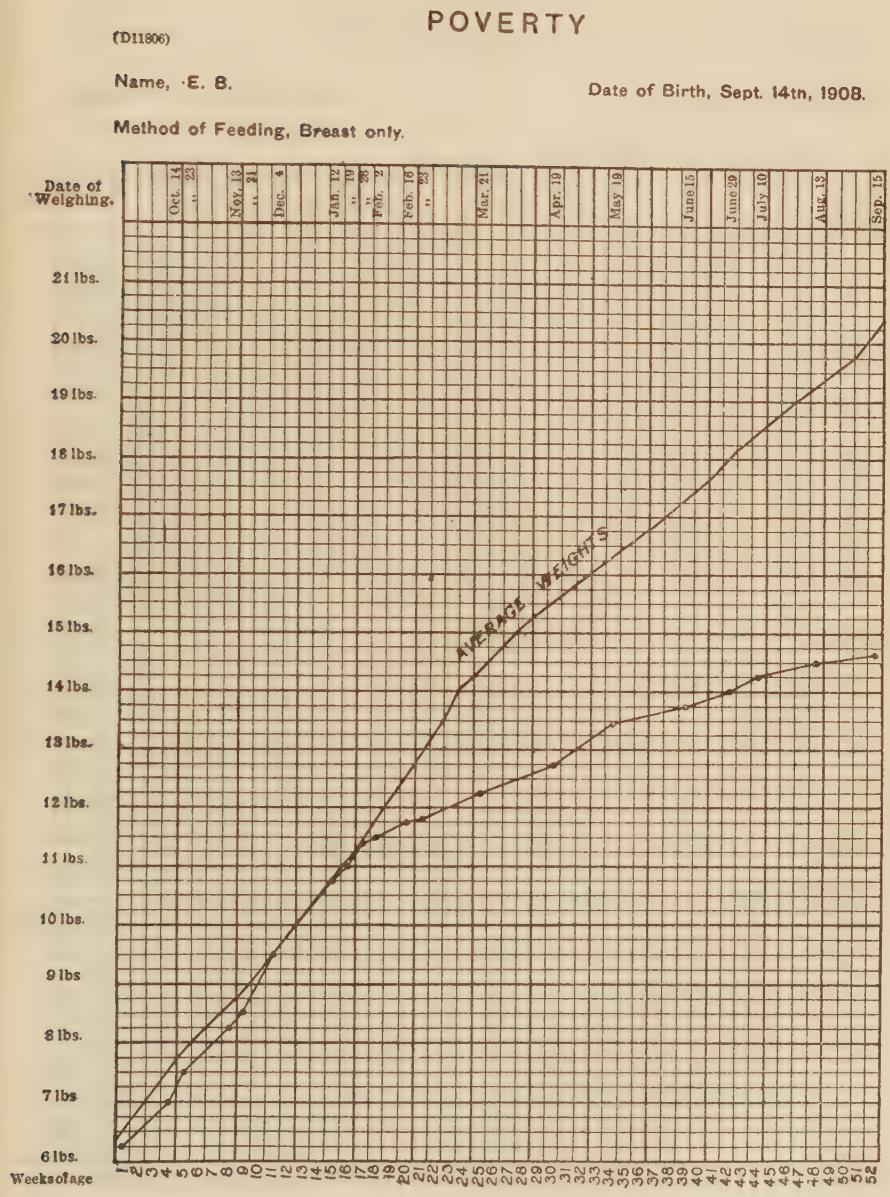
POVERTY.

(D11806)

Name, H C. Date of Birth, Sept. 11th, 1908.

Method of Feeding, Breast only.



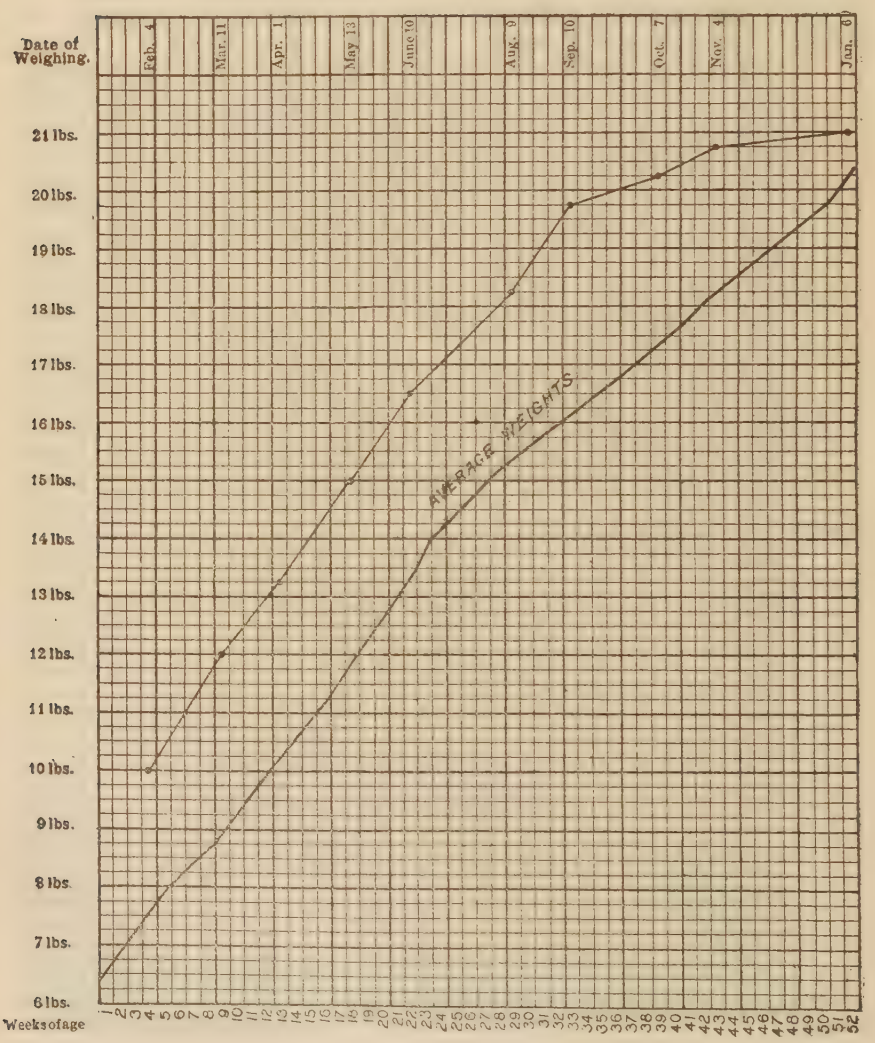

POVERTY
(D11806)
Name, E. S.
Date of Birth, Sept. 14th, 1908.
Method of Feeding, Breast only.
Date of Weighing.
Oct. 14
" 23
Nov. 13
" 21
Dec. 4
Jan. 12
" 19
" 26
Feb. 2
Feb. 16
" 23
Mar. 21
Apr. 19
May 19
June 15
June 29
July 10
Aug. 13
Sep. 15
21 lbs.
20 lbs.
19 lbs.
18 lbs.
17 lbs.
16 lbs.
15 lbs.
14 lbs.
13 lbs.
12 lbs.
11 lbs.
10 lbs.
9 lbs
8 lbs.
7 lbs
6 lbs.
Weeks of age
AVERAGE WEIGHTS

NO POVERTY

(D11806)

Name, C. F. Date of Birth, Jan. 6th, 1909.

Method of Feeding, Breast only.



ALTERSPROBLEME GEWERBLICHER HYGIENE.

Dr. Ludwig Teleky, Privatdozent, Wien, Austria.

Elend und Armut hat es auch schon in älteren Zeiten gegeben, aber eine Art von Unterdrückung und Elend muss—wie Held in seinen "Zwei Bücher zur sozialen Geschichte Englands" ausführt—als ein durchaus eigentümliches Produkt der modernen Grossindustrie bezeichnet werden, nämlich die Ausbeutung der Kinder unter Auflösung der Familienbande und gänzlichen Mangel an Rücksicht auf die Heranziehung einer gesunden kräftigen Generation.

Dieses letztere Moment war es, das schon frühzeitig die Aufmerksamkeit von Aerzten und Militärs auf die schädlichen Folgen der Beschäftigung von Kindern in Fabriken lenkte.

In Oesterreich wurden bereits unter dem 20. XI. 1787 "Zur Beseitigung der bemerkten Gebrechen bei der physischen Erziehung der Fabrikslehrlinge" die ersten Anordnungen für den Schutz der kindlichen Arbeit erlassen, denen unter dem 12. III. 1816 weitere Bestimmungen folgten, die den städtischen und den Bezirksärzten eine genaue Aufsicht und Untersuchung der körperlichen Pflege der Kinder in den Fabriken zur Pflicht machten, "da bei Fabriken die Gefahr der Verkrüppelung und Verwahrlosung doppelt gross ist." In England war es Dr. Percival vom Manchester Board of Health, der 1796 auf die Schädlichkeiten der Kinderarbeit hinwies; 1802 wurde das erste englische Arbeiterschutzgesetz erlassen, das sich fast ausschliesslich mit der Kinderarbeit in Fabriken beschäftigte. In Preussen wurde, vor allem Dank einem "Landwehrgeschäftsberichte" des Generallieutenants von Horn 1839 ein "Regulativ über die Beschäftigung jugendlicher Arbeiter in Fabriken" erlassen.

So steht überall der Kinderschutz am Uranfang aller Arbeiterschutzbestrebungen, und Sorge um Gesundheit und Kraft der heranwachsenden Generation, deren Entwicklung durch die Fabriksarbeit schwer geschädigt wird, ist der Beweggrund dieser ersten Schutzgesetze.

Jeder wachsende Organismus, jeder Organismus, der noch an seinem eigenen Aufbau arbeitet, ist besonders empfindlich gegen äussere Schädigung, gegen zu geringe Einnahmen (unzureichende Nahrung), zu grosse Ausgaben (übermässige Arbeitsleistung). Allen Tierzüchtern ist es bekannt, dass diese Schädigungen nicht nur zu quantitativen, sondern auch zu qualitativen Unterschieden (Verunstaltungen) führen.

Der kindliche Organismus hat einen lebhafteren Stoffwechsel als der erwachsene, die CO_2 Abgabe, die bei annähernd gleichartiger Ernährung als relatives Mass des Stoffwechsels gelten kann, ist (nach Tigerstedt und Sondén):

Mittleres Alter in Jahren, männliches Geschlecht.	CO_2 pro Stunde und Kilogramm.	CO_2 pro Stunde und m^2 Körperoberfläche.
	g.	g.
7.86	1.149	26.27
9.59	1.207	29.86
10.53	1.106	28.22
11.39	1.063	27.54
14.54	.960	26.65
19.51	.718	21.81
25	.569	18.48

Die 24stündige Zufuhr von Nahrungsmitteln ist beim Kinde (relativ) grösser als beim Erwachsenen. Sie beträgt nach Cammerer:

Alter: Jahre männliches Geschlecht.	Kalorien pro Kilogramm in 24 Stunden.	Kalorien pro m^2 Körperoberfläche in 24 Stunden.
5–6	76.7	1,680
7–10	61.7	1,440
11–14	47.4	1,250
15–16	39.8	1,220
17–18	37.7	1,200
Erwachsenen.	32.0	1,071

Bedingt ist diese grössere Nahrungsaufnahme durch das Bedürfnis des wachsenden Körpers einerseits, durch die Kleinheit des kindlichen Körpers und den dadurch veranlassten grösseren Wärmeverlust andererseits.

Machen schon diese Momente: Aufbau des eigenen Körpers, ungünstige Wärmeökonomie, das Kind empfänglicher für alle den normalen Stoffwechsel ungünstig beeinflussende Schädlichkeiten (Mangel an Bewegung, an frischer Luft, wie sie Fabriksarbeit meist mit sich bringt) und deshalb zur Arbeit wenig geeignet, so kommt hiezu noch der Umstand, dass bei der relativ leichten Beeinflussbarkeit der Wachstumsvorgänge die länger dauernde Belastung oder Ueberanstrengung einzelner Teile des Körpers zu Schädigungen derselben führt. Es sei hier nur als Beispiel auf die "Fabriksbeine," "Bäckerbeine" und die Rückgratsverkrümmungen sicilischer Carusi verwiesen, aber auch auf die Schulscoliose, die Schulkurzsichtigkeit.

Es darf uns deshalb nicht wunder nehmen, wenn nicht nur in jenen frühesten Zeiten barbarischester Kinderausnützung, wie sie für das erste Erwachen grossindustrieller Betriebsweise in fast allen Ländern charakteristisch war, über schwere Schädigung der Gesund-

heit der Kinder geklagt wird, sondern wenn uns über ähnliche krankmachende Wirkung von überall dort berichtet wird, wo Kinderarbeit auch heute noch besteht.

Im Kanton Appenzell A. Rh., wo die Kinder in der Textilindustrie (Fabriks- und Heimarbeit) stark beschäftigt werden, ergab die Recrutirung (nach Dr. Wiesmann, citirt nach Zinsli, "Kinderarbeit und Kinderschutz in der Schweiz," p. 68) folgende Resultate in Prozent der endgültig Untersuchten, an denen wohl zum Teil eben diese Kinderarbeit schuld ist.

Dienstbefreiungsgründe.	Appenzell A. Rh., 1893–1902.	Schweiz, 1893–1901.
	%	%
Zu geringe Körperlänge	57.2	23.7
Zu geringer Brustumfang	13.7	11.1
Schwächlichkeit, Anaemie	47.7	24.2
	118.6	59.0
Geistige Beschränktheit	14.0	8.7
Sehschwäche infolge Myopie	27.5	27.5
Sehfehler infolge anderer Refractionsfehler	45.1	19.7
Difformitäten der Wirbelsäule	9.6	8.8
Krankheiten des Herzens und der grossen Gefässe	20.2	12.9

Die vom K. K. arbeitsstatistischen Amt im Handelsministerium veranstalteten Erhebungen über die Kinderarbeit in Oesterreich ergaben, dass bei den in die Untersuchung ein bezogenen arbeitenden Schulkindern der Gesundheitszustand in 22.6 Prozent nicht befriedigend war und zwar bei den in der Landwirthschaft tätigen bei 17.3 Prozent, bei in der Industrie tätigen bei 29.6 Prozent, bei in mehreren Arbeitszweigen tätigen in 23.9 Prozent. Aber auch innerhalb der beiden letztgenannten Gruppen sind grosse Differenzen zu beobachten. Nicht befriedigend ist der Zustand bei Kindern, die tätig sind: in der Rohglaserzeugung (insgesamt 120) bei 50 Prozent, Erzeugung von Metallkapseln (insgesamt 241) in 46.5 Prozent, in der Textilindustrie bei 33.7 Prozent, Fransenknüpfen (insgesamt 273) 45.8 Prozent, Haarnetzerzeugung 42.7 Prozent.

Bei den in Industrie und Hauswirtschaft beschäftigten zeigen 33.5 Prozent nicht befriedigenden Gesundheitszustand, unter den im Haushalt und der Glasperlenerzeugung beschäftigten 70 in die Untersuchung einbezogenen Kinder 40, unter den im Haushalt und in der Bekleidungs-und Putzwarenindustrie beschäftigten Kindern (606) 38 Prozent. Leider fehlen als Vergleichsobjecte Angaben über den Gesundheitszustand nicht arbeitender Kinder.

Nebenbei sei noch bemerkt, dass nachteiliger Einfluss der Arbeit auf den Schulbesuch oder das Verhalten in der Schule festgestellt wurde bei 49.4 Prozent der arbeitenden Kinder, und zwar bei den in der Landwirtschaft tätigen bei 53.7 Prozent, bei den in der Industrie tätigen bei 46.7 Prozent, bei den in mehreren Arbeitszweigen tätigen bei 54 Prozent.

Berichten alle jene, die sich mit der Frage der Kinderarbeit in objectiver Weise und ernstlich beschäftigt haben, über die schwere Schädigung der Kinder durch die Erwerbsarbeit, so dass an dieser Tatsache selbst nicht im mindesten gezweifelt werden kann, so liegen doch exactere Messungen und Wägungen aus neuerer Zeit hierüber nicht vor. Erwähnenswert aber erscheinen Untersuchungen, die Corwell unter der armen Bevölkerung in Manchester und Stockport angestellt hat, und die Quetelet in seinem Werke "Ueber den Menschen und die Entwicklung seiner Fähigkeiten," 1835 (deutsch von A. Rieche, Stuttgart, 1838), citirt.

Mittlere Grösse und mittleres Gewicht der Kinder aus den unteren Volksklassen in Manchester und Stockport.

[Nach Quetelet.]

Alter in Jahren.	Knaben—		Mädchen—		Knaben—		Mädchen—	
	Die in Fabriken arbeiten.	Die nicht in Fabriken arbeiten.	Die in Fabriken arbeiten.	Die nicht in Fabriken arbeiten.	Die in Fabriken arbeiten.	Die nicht in Fabriken arbeiten.	Die in Fabriken arbeiten.	Die nicht in Fabriken arbeiten.
	Meter.	*Meter.*	*Meter.*	*Meter.*	*Kilogramm.*	*Kilogramm.*	*Kilogramm.*	*Kilogramm.*
9	1.222	1.233	1.218	1.230	23.47	24.15	23.18	22.87
10	1.270	1.236	1.260	1.254	25.84	27.33	24.85	24.68
11	1.302	1.296	1.299	1.323	28.04	.....	27.06	27.72
12	1.355	1.345	1.364	1.363	29.91	30.49	29.96	29.96
13	1.383	1.396	1.413	1.399	32.69	34.17	33.21	32.97
14	1.437	1.440	1.467	1.479	34.95	35.67	37.82	37.83
15	1.515	1.474	1.486	1.502	40.06	39.37	39.84	42.44
16	1.565	1.605	1.521	1.475	44.43	50.01	43.62	.....
17	1.592	1.627	1.535	1.542	47.36	53.41	45.44	46.45
18	1.608	1.775	1.593	1.645	48.12	57.27	48.22	55.32
Zahl der Gemessenen.	410	227	652	201	420	223	651	201

Bemerkt muss zu dieser Tabelle werden, dass im Alter von 16, 17, 18 Jahren nur wenige Mädchen, die nicht in Fabriken arbeiteten, gewogen wurden. Wieviel Kinder überhaupt in jeder Altersklasse gewogen und gemessen wurden, ist leider nicht angegeben; auf die wohl in einzelnen Altersklassen allzu geringe Zahl der Untersuchten, sind wahrscheinlich die Unstimmigkeiten der Tabellen zurückzuführen, doch ergibt sich aus ihnen im allgemeinen eine ungünstigere Körperentwicklung der Fabrikarbeit verrichtenden Kinder in den letzten beobachteten Altersclassen.

Bemerkt sei hier auch noch, dass es bereits Quetelet und vor ihm Villermé bekannt war, dass "der Wuchs der Männer unter im übrigen gleichen Umständen im Verhältnis zu den Vermögensumständen oder wenigstens in einem umgekehrten Verhältnis zu den Mühen, den Anstrengungen, den Entbehrungen, die sie in der Kindheit und Jugend zu erdulden haben, steht," eine Beobachtung, die seitdem von den verschiedensten Autoren sowohl bei Erwachsenen: Broca, Roberts u. Rawson, Tarnowsky, Pfitzner, Niceforo, als auch bei Kindern: Pagliani, Niceforo, der dänischen Schulkommission

u. a. vollinhaltlich bestätigt und von einzelnen dieser Autoren durch Ausdehnung der Untersuchung auf Brustumfang, Gewicht und Anderes erweitert wurde. Quirsfeld (Zeitschrift für Schulgesundheitspflege, 1905, Nr. 3, 4) formulirt seine Beobachtungen etwas anders: "Gleichalterige und beim Schuleintritt gleich grosse Kinder bemittelter Eltern erreichen bis zum Schlusse des 4. Schuljahres gegenüber den Kindern armer Eltern durchschnittlich eine um 7 Prozent grössere Körperlänge, einen um 4 Prozent grösseren Brustumfang, ein um 6 Prozent grösseres Körpergewicht."

Wie die eben citirte Arbeit, so bieten uns überhaupt jene zahlreichen, vor allem zu schulhygienischen Zwecken vorgenommenen Massenuntersuchungen von Schulkindern manches, wenigstens indirect verwertbare Material, denn aus dem, was über die schädlichen Folgen der Arbeit in der Schule festgestellt wurde, lassen sich wohl Schlüsse auf die Folgen kindlicher Erwerbsarbeit ziehen.

Wie ungemein empfindlich der Organismus im früheren Kindesalter gegen jede Art von Arbeitsleistung ist, zeigt am besten die Untersuchung Schmid-Monnards (Zeitschrift für Schulgesundheitspflege, etc., 1897, p. 593), der wir die folgende Tabelle entnehmen, wobei noch ausdrücklich bemerkt sei, dass jeder Angabe mindestens 50 Beobachtungen zu Grunde liegen. Diese Tabelle zeigt uns, um wie viel schlechter sich die Schule besuchende 6–7 jährige Kinder entwickeln als gleichalterige nicht die Schule besuchende Kinder. "In den ersten 3 Monaten des Schulbesuches verringert sich das Durchschnittsgewicht der Volksschulmädchen um ¾ Kg., ebenso zeigt sich bei allen Elementarschulkindern in dem nächsten Jahre ein verlangsamtes Tempo der Gewichtszunahme" fügt Schmid-Monnard noch den in Tabellenform niedergelegten Beobachtungen hinzu.

[Nach Schmid-Monnard.]

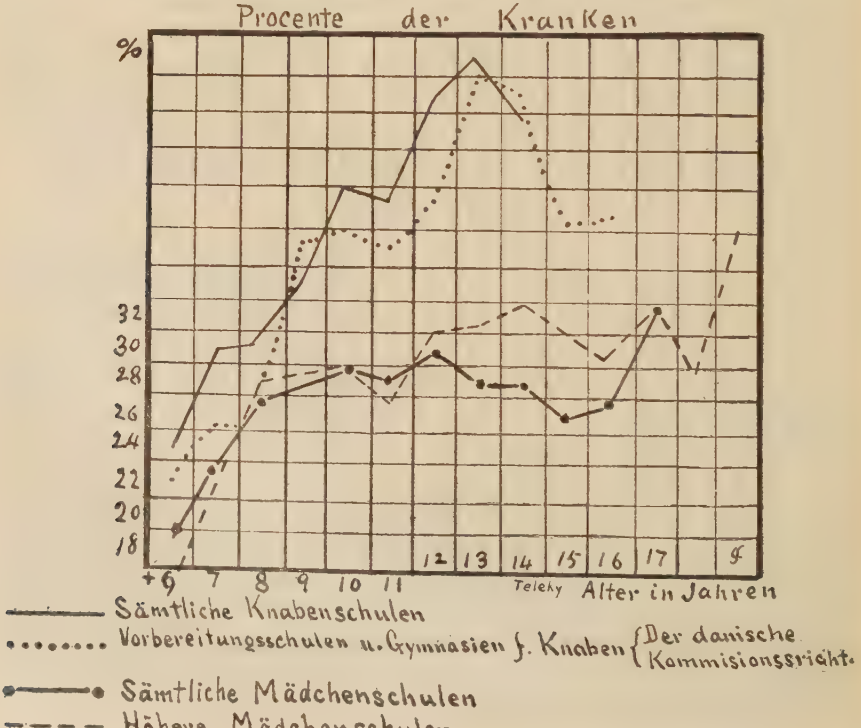
	Gewichtszunahme in Kilogramm während des 7. Lebensjahres.		Längenwachstum in Centimeter während des 7. Lebensjahres.	
	Knaben.	Mädchen.	Knaben.	Mädchen.
Nicht Schulpflichtige, 6–7jährige	2.2	1.9	7.4	5.6
Schulpflichtige, 6–7jährige	1.5	.6	4.2	4.5
Differenz zu Ungunsten der die Schule besuchenden	0.7	1.3	3.2	1.1

Quirsfeld bemerkt, dass die Entwicklung des Brustumfanges bei den Mädchen im allgemeinen gegenüber den Knaben zurückbleibt, diese Erscheinung aber am auffallendsten vom 3. zum 4. Schuljahr sich geltend mache, und er bringt dies damit in Zusammenhang, dass im 3. Schuljahr bei den Mädchen der Handarbeitsunterricht beginnt.

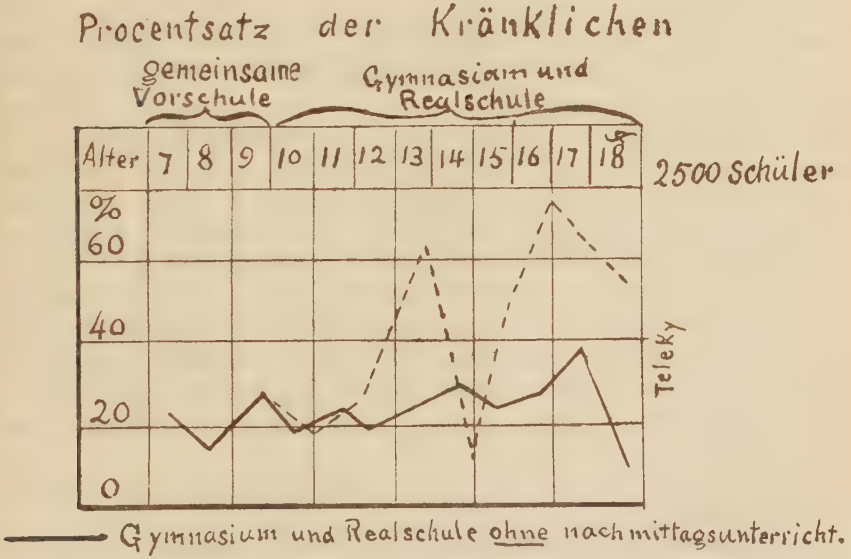
Ich habe oben darauf hingewiesen, dass nach allen Untersuchern die Kinder der Minderbemittelten in körperlicher Entwicklung hinter den der Bemittelten zurückbleiben; man würde demnach erwarten, dass diese letzteren auch weniger kränklich sind, und tatsächlich bestätigten diese Meinung auch die Untersuchungen Quirsfelds über die untersten 4 Schuljahre.

Betrachten wir aber die Kinder verschiedener Schulen, in denen verschiedene Ansprüche an die Arbeitskraft der Kinder gestellt werden, so zeigt sich bald eine Umkehr der Verhältnisse. Ich entnehme die beifolgende Curve, die die Ergebnisse des dänischen Commissionsberichtes wiedergibt, einer Arbeit Axel Hertels (Zeitschrift für Schulgesundheitspflege, 1888, Nr. 6):

Wir sind hier in der Lage die Krankheitsverhältnisse, d. h. den Procentsatz der kranken oder kränklichen Schüler in sämtlichen Knabenschulen mit den in den Vorbereitungsschulen und Gymnasien zu vergleichen und bei den Mädchen den in sämtlichen Mädchenschulen mit den in höheren Mädchenschulen, müssen aber leider hinzufügen, dass ein Unterschied im Erhebungsmodus die Verlässlichkeit des Vergleiches sehr beeinflusst; in den höheren Schulen wurde ein Attest des Hausarztes über den Gesundheitszustand den statistischen Zusammenstellungen zu Grunde gelegt, in den niederen Schulen durch eigene Aerzte Untersuchungen vorgenommen.



Bei den Mädchenschulen tritt im allgemeinen—mit Ausnahme eines Jahres—das Erwartete ein; die (schwächlichen) Mädchen in der Gesamtheit aller Schulen zeigen ein grösseres Prozent kranker als die ausschliesslich den höheren Schichten angehörenden (d. s. kräftigeren) Schülerinnen höherer Töchterschulen. Bei den Knaben aber zeigen vom 12. Jahre an die Gymnasiasten—trotzdem sie im allgemeinen zu den körperlich besser entwickelten höheren Schichten gehören—eine grössere Kränklichkeit als dem Durchschnitt der Schüler aller Schulen entspricht. Es ist wohl gestattet diesen Umstand mit der höheren von ihnen geforderten Arbeitsleistung in Zusammenhang zu bringen. Dass sowohl bei Knaben als bei Mädchen das Ende der Curve sämtlicher Schulen mit der Curve der höheren Schulen zusammenfällt, erklärt such daraus dass mit Aufhören der Schulpflicht in niedrigeren Schulen, der Verlauf der Curve sämtlicher Schulen nun ausschliesslich durch die der höheren Schulen bestimmt wird.



Deutlich zeigt sich der Einfluss der erhöhten Arbeitsleistung in den Untersuchungen Schmid-Monnards, der die Häufigkeit chronischer Kränklichkeit in den höheren Schulen mit und ohne Nachmittagsunterricht mit einander vergleicht. Mit Ausnahme des 14. Jahres ist vom 13. Jahre an in allen Altersklassen die Häufigkeit der Kränklichkeit in der Schule mit Nachmittagsunterricht um sehr vieles grösser, durchschnittlich doppelt so gross als in den Schulen, in denen nur Vormittags Unterricht erteilt wird.

Aus der ungeheuren Zahl von Arbeiten und Untersuchungen, die sich mit der Wirkung der Schule und der Arbeit in der Schule auf die körperliche Entwicklung und die Gesundheit der Kinder beschäftigen, haben wir nur diese wenigen Daten herausgehoben, wir wollen auch nicht näher auf jene Arbeiten eingehen, die die Schädigungen der Augen durch die Schularbeit—von Klasse zu Klasse zunehmende Zahl der Kurzsichtigen—darlegen oder die Häufigkeit der Rückgratsverkrümmungen infolge langen Sitzens auf ungeeigneten Subsellien.

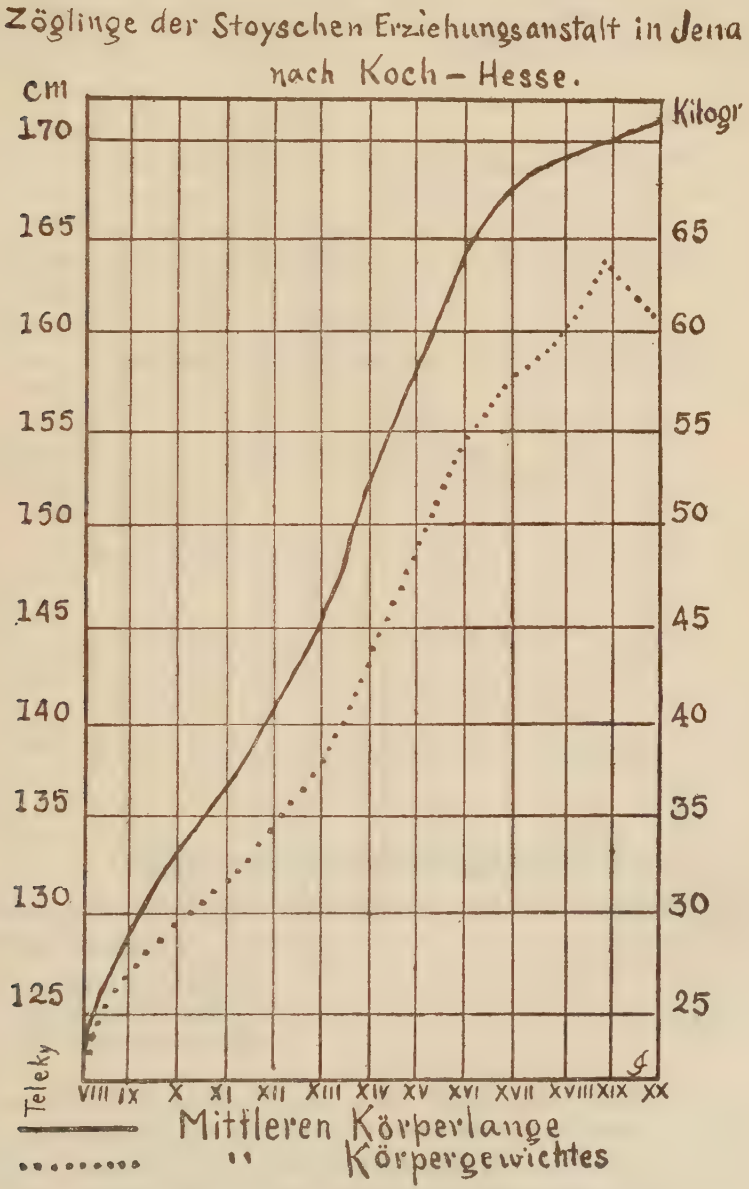
Aus allen diesen Untersuchungen geht mit aller Klarheit hervor, wie ungemein empfindlich nicht nur der kindliche, sondern der heranwachsende Organismus überhaupt auf jedes Mehr an Arbeit, auf jede stärkere Inanspruchnahme, auf jede äussere Schädlichkeit, mit Zurückbleiben in der Entwicklung mit erhöhter Kränklichkeit, mit irreparablen Veränderungen einzelner Organe oder Körperteile (Augen, Wirbelsäule) reagirt.

Wenn man neben ernsten und mühevollen Untersuchungen in den einschlägigen Fachblättern gar nicht selten pathetische Klagen über die schwere Schädigung der Volksgesundheit durch Ueberlastung der Schüler an den höheren Schulen und der Schülerinnen an höheren Töchterschulen findet—Klagen, die ein lebhaftes Echo in der Tagespresse finden—dann muss man sich wohl über den engen Gesichtskreis mancher dieser Herren wundern, die ganz daran vergessen, dass für die Gesundheit der Nation die Erwerbsarbeit von Kindern und Jugendlichen schädlicher ist als die Ueberarbeit an höheren Schulen, die ja nur von einem kleinen Bruchteil der Kinder besucht werden und deren Anforderungen ja nur eine Elite gewachsen sein soll. Ein Teil des auf die Reform der höheren Schulen aufgewandten Pathos hätte wahrscheinlich genügt, um weiterer gesetzlicher Einschränkung der Erwerbsarbeit von Kindern und Jugendlichen die Wege zu ebnen.

Mit wieviel Jahren, und in welchem Ausmasse soll das Kind zur Erwerbsarbeit zugelassen werden?

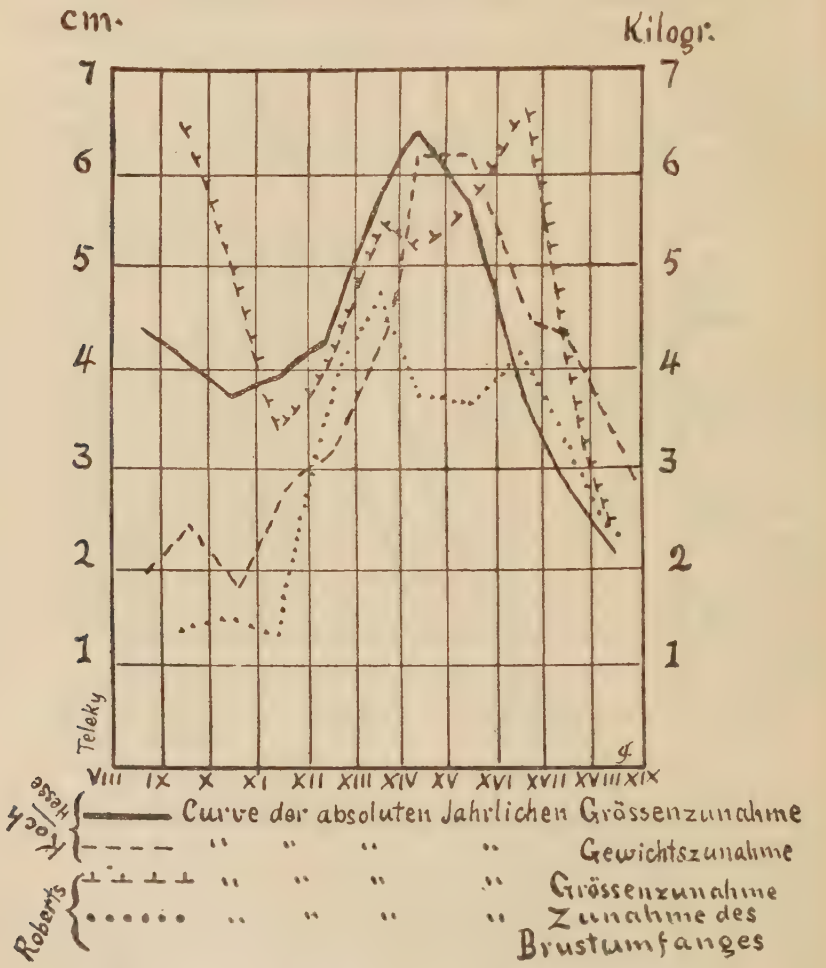
Betrachten wir die Wachstumscurven nach irgend einem der verschiedenen Autoren, die entsprechende Messungen und Wägungen vorgenommen haben, z. B. nach den genauen Ermittelungen Koch-Hesses (Zeitschrift für Schulgesundheitspflege, 1905) so sehen wir ein fast gleichmässiges Ansteigen der Körperlänge bis zum 17., des Körpergewichtes bis zum 19. Lebensjahre. Betrachten wir genauer das Wachstum in jedem einzelnen Lebensjahr, so sehen wir nach Koch-Hesse, der in einem Jenaer Institut für Wohlhabende seine Messungen vornahm, die stärkste Grössenzunahme im 15., aber auch noch in den folgenden Jahren eine sehr bedeutende Grössenzunahme; nach anderen Autoren fällt das Maximum der Grössenzunahme in späteres Alter, so nach Kotelmann (Schüler des Johan-

neums in Hamburg) ins 16., nach Bowditsch und Roberts (englische Schüler) ins 17. Lebensjahr (citirt nach Gruber, Schriften der Gesellschaft für soziale Reform Heft 38, 39). Das Maximum der



Gewichtszunahme fällt in das 15. Jahr (nach Koch-Hesse), in das 16. (nach Roberts und Bowditsch) aber auch in den nächstfolgenden Jahren ist die Gewichtszunahme eine sehr bedeutende.

Bei dieser allmählich und bis zum 18. und 19. Jahre in raschem Tempo—wenn auch in den letzen dieser Jahre bereits etwas verlangsamt—fortschreitenden Entwicklung, auf Grund physiologischer Erwägungen eine Grenze ziehen zu wollen, von der an Erwerbsarbeit gestattet sein soll, ist unmöglich; insbesondere ist zu bedenken, dass ja Erwerbsarbeit nicht die erste Arbeit ist, die der



heranwachsende Mensch zu leisten hat; die Erwerbsarbeit tritt an Stelle der Schularbeit. Sie unterscheidet sich von der letzteren aber nicht nur durch ihre wirtschaftliche Bedeutung, sondern vor allem auch dadurch, dass während die Schularbeit der Weiterentwicklung des kindlichen Geistes und Körpers zu dienen bestimmt ist, die Erwerbsarbeit natürlich auf diese Momente keine Rücksicht nehmen kann. Erwerbsarbeit ist, wenn sie gewerbliche Arbeit ist, häufig von

grosser Monotonie, sie beschäftigt oft nur einzelne Muskelgruppen diese aber in übermässigem Masse, zwingt zu vielstündigem Sitzen, und weder Lüftungsverhältnisse noch Subsellien entsprechen jenen Anforderungen, die heute (wenigstens in den Städten) an die entsprechenden Schuleinrichtungen gestellt werden. Arbeit in der Landwirtschaft ist häufig körperlich anstrengend, und verkürzt oftmals den Kindern die gerade ihnen so notwendige Nachtruhe; das letztere gilt auch von den Austrägerdiensten und zum Teil auch von der Arbeit in Wirtsgeschäften.

Wenn es aber unmöglich ist auf Grund physiologischer Erwägungen eine Altersgrenze zu bestimmen, von der an Erwerbsarbeit überhaupt oder irgend eine Art der Erwerbsarbeit für den kindlichen Organismus nicht mehr schädlich ist, so können wir doch sagen, dass jeder rasche Uebergang in neue Verhältnisse, jede plötzliche Uebernahme neuer, schwerer Pflichten auf den jugendlichen Organismus nachteilig einwirkt; am nützlichsten für die heranwachsende Generation wäre der allmähliche Uebergang aus der Schule mit Handfertigkeitsunterricht in die Lehrwerkstätte mit weiterem anfangs recht reichlich bemessenem Fortbildungsunterricht.

Anderseits können wir versuchen zu ermitteln wie die ersten Jahre der Arbeit, insbesondere die in der "Lehre" oder der Fabrik auf die Gesundheit unserer Jugendlichen einwirken. Daten hierüber liefert uns die Krankenkassenstatistik und die österreichische, speciell die Wiener Statistik erscheint uns für diese Zwecke besonders geeignet. Erfolgt doch hier der Eintritt ins Erwerbsleben relativ—d. h., im Vergleich mit anderen Ländern—spät. Kinder dürfen vor vollendetem 14. Lebensjahr in Fabriken überhaupt nicht beschäftigt werden, hingegen ist Beschäftigung von Kindern bis zur Dauer von 8 Stunden täglich vom vollendeten 12. bis zum vollendeten 14. Lebensjahr in kleingewerblichen Betrieben gestattet, "sofern ihre Arbeit der Gesundheit nicht nachteilig ist und die körperliche Entwicklung nicht hindert, dann der gesetzlichen Schulpflicht nicht im Wege steht." Da die gesetzliche Schulpflicht bis zum vollendeten 14. Lebensjahre dauert, sogenannte "Schulbesuchserleichterungen," die anderwärts eine grosse Rolle spielen, in Wien so gut wie gar nicht, resp. höchstens für wenige Wochen vor Vollendung des 14. Lebensjahres erteilt werden, so erfolgt in Wien der Eintritt ins Erwerbsleben mit vollendetem 14. Lebensjahr (abgesehen von der nicht sehr verbreiteten Heimarbeit der Kinder). In Fabriken dürfen 14–16 jährige nur unter denselben Beschränkungen (jedoch bis 11 Stunden) beschäftigt werden wie 12–14 jährige im Kleingewerbe. Bis zum vollendeten 16. Lebensjahr ist die Nachtarbeit, d. h., Arbeit zwischen 8 Uhr abends bis 5 Uhr morgens in allen Arten von gewerblichen Betrieben—abgesehen von den durch das Handelsministerium gewährten Ausnahmen—verboten.

Trotzdem lehrt uns die Krankenkassenstatistik, dass die Erkrankungshäufigkeit der jugendlichen Arbeiter eine exorbitant hohe ist, wobei noch bemerkenswert, dass nicht unmittelbar nach Eintritt ins Erwerbsleben, in Alter von 14 Jahren die grösste Erkrankungshäufigkeit eintritt, sondern scheinbar erst dann, wenn alle Schädlichkeiten der Berufsarbeit längere Zeit gewirkt—im bemerkenswerten Gegensatz zu dem oben über den Schuleintritt gesagten. Auch ist es von Interesse, dass in der kaufmännischen (Gremial-) Krankenkasse die Erscheinung nicht so deutlich zu Tage tritt wie in den übrigen Krankenkassen, was wohl darauf zurückzuführen, dass die Angehörigen der ersteren Kasse weniger körperliche Arbeit zu leisten haben.

Bei den Wiener Krankenkassen kommen (meist 1892–1902) auf 100 des durchschnittlichen Mitgliederstandes mit Arbeitsunfähigkeit.

[Nach S. Rosenfeld, Statistische Monatsschrift 1905.]

Alter in Jahren.	Erkrankte.		Erkrankungen.	
	Männer.	Frauen.	Männer.	Frauen.
14	37.61	22.92	43.82	26.99
15	62.94	41.52	81.50	49.13
16	58.78	40.28	75.81	49.88
17	43.28	39.06	54.51	48.45
18	37.46	38.22	46.40	47.68
24	34.54	36.28	34.72	40.12

[Nach S. Rosenfeld, Statistische Monatsschrift 1905.]

Alter in Jahren.	Krankenprozent.				Erkrankungsprozent.			
	Bezirks-Kranken-Kasse.	Allg. Arbeiter-Kranken-Kasse.	Genossenschafts-Kranken-Kasse.	Gremial-Kranken-Kasse.	Bezirks-Kranken-Kasse.	Allg. Arbeiter-Kranken-Kasse.	Genossenschafts-Kranken-Kasse.	Gremial-Kranken-Kasse.
Unter 15	161.11	34.27	38.75	.....	189.26	45.93	46.17	.....
16–20	50.18	42.12	31.35	17.80	58.39	57.35	38.76	20.91
21–25	28.89	39.16	26.15	16.81	34.74	53.40	33.10	20.40

Erwähnt sei hier auch, dass Kaup (Die jugendlichen Arbeiter in Deutschland. Schriften der Gesellschaft für soziale Reform, Heft 36) über ähnliche Erfahrungen in deutschen Krankenkassen berichtet, und auch—nach Kayserlings Untersuchungen—darauf hinweist, dass während die Tuberkulosesterblichkeit in Deutschland in den anderen Altersklassen sinkt, die für die Altersgruppe vom 15.–20. Lebensjahre in Berlin für junge Männer seit 1896 unverändert geblieben ist, während sie in dieser Altersgruppe in den letzten Jahren für das weibliche Geschlecht, das in immer grösserem Umfange am Erwerbsleben teilnimmt, sogar etwas ansteigt.

Pirquet führt es auf die Einwirkung der Berufsarbeit zurück, dass die Tuberkulosemortalität, die vom 5.–15. Lebensjahr relativ so gering, vom 15.–20. Lebensjahr um so viel grösser ist.

Auch die Unfallgefährdung jugendlicher Arbeiter ist eine ganz abnorm hohe. Nach der Statistik der Leipziger Ortskrankenkasse entfielen von allen Arten von Unfällen (Unfälle überhaupt, Betriebsunfälle, leichtere und schwerere Unfälle, leichtere und schwerere Betriebsunfälle)—mit alleiniger Ausnahme der tötlichen Unfälle—relativ sehr viel mehr auf die Jahre unter 19, und da wieder besonders viel auf die unter 15 Jahren als auf die folgenden Altersklassen.

Nach Statistik der Leipziger Ortskrankenkasse entfielen auf 100 ein Jahr lang beobachtete Personen:

	Unfälle überhaupt—		Darunter Betriebsunfälle—		Unfallkrankheitstage aus Fällen—		Darunter Betriebsunfall krankheitstage aus Unfällen—		Mehr als 13 Wochen dauernde Betriebsunfälle.	Tötliche Betriebsunfälle.
	Bis 28 Tage.	Über 28 Tage.	Bis 28 Tage.	Über 28 Tage.	Unter 28 Tagen.	Über 28 Tage.	Über 28 Tage.	Unter 28 Tagen.		
Unter 15 Jahren	12.42	1.90	4.66	1.06	144.72	92.24	59.69	55.43	0.179	.....
15–19 Jahren	10.18	1.40	3.69	.79	112.89	67.14	44.66	38.16	.075	12
20–24 Jahren	7.67	1.04	2.95	.67	81.57	53.64	34.29	35.27	.093	18
25–29 Jahren	7.28	1.15	3.07	.75	79.96	62.19	36.23	41.53	.140	17

Mag von den Unfällen manches auf die Ungeübtheit jugendlicher Arbeiter zurückzuführen sein, so kommt doch auch manches auf Uebermüdung, manches auf die mangelnde körperliche und geistige Reife der Jugendlichen.

Zweifellos aber geht aus all diesen Angaben hervor, dass der gegen jedes Uebermass von Arbeit so ungemein empfindliche heranwachsende Organismus selbst im 15. Lebensjahre—in welchem Jahre in Oesterreich und Deutschland meist der Austritt aus der Schule, der Uebertritt in die Erwerbsarbeit erfolgt—den Anforderungen, die diese letztere in ihrer heutigen Gestalt an ihn stellt, nicht gewachsen ist. Wir werden also vom hygienischen Standpunkte aus ein Hinaufrücken des Schutzalters, ein Verbot der Arbeit in Gewerbebetrieben und Fabriken vor vollendetem 16. Lebensjahre fordern müssen, wenn wir uns auch der wirtschaftlichen Schwierigkeiten, die der Erfüllung dieser Forderung entgegenstehen, wohl bewusst sind.

In gesundheitlicher Hinsicht der Arbeit in Gewerbebetrieben und Fabriken gleich zu stellen, ja infolge mangelhafter Arbeitsräume und überlanger Arbeitszeit noch bedenklicher als diese, ist die Heimarbeit.

Landwirtschaftliche Arbeit unterscheidet sich von gewerblicher in hygienischer Beziehung vor allem dadurch, dass sie meist in freier Luft erfolgt; wenn aber von mancher Seite behauptet wird, dass die landwirtschaftliche Arbeit der Kinder leichte Arbeit sei, so ist darauf

hinzuweisen, dass einerseits Kinder auch zu landwirtschaftlichen Arbeiten schwerster Art: Mähen, Dreschen, Häckerling-schneiden verwendet werden, dass aber auch Arbeiten, die an sich nur geringe Kraft erfordern, z. B., Engerlinge klauben, Raupen abklauben u. dergl. durch einige Stunden fortgesetzt, doch zu schwerer Anstrengung werden, wie ja auch das Aufnähen von Knöpfen, Auffädeln von Perlen u. dergl. in der Hausindustrie nicht an sich, sondern erst durch längere Zeit fortgesetzt, anstrengt und ermüdet.

Aber auch der Organismus des 16jährigen ist noch nicht jeder Arbeit gewachsen, auch er muss noch vor überlanger Arbeitszeit, sowie vor Arbeiten, die besondere Schädlichkeiten mit sich bringen: Arbeit in hoher Temperatur, Arbeit unter Tags, Nachtarbeit geschützt werden. Die Arbeitszeit jugendlicher Personen im Alter von 16–18 Jahren ist durch die Gesetzgebung zu begrenzen und soll 8 Stunden täglich nicht übersteigen.

Mit Recht verlangt Kaup—allerdings für die männlichen Jugendlichen von 14–18 Jahren—dass die in Fortbildungs- und Fachschulen verbrachte Zeit (mindestens 2 Halbtage wöchentlich) in die gesetzlich zulässige Arbeitszeit einzurechnen und wöchentlich mindestens ein Halbtag (ausser dem Sonntag) für körperliche Uebungen freizugeben ist. Er nähert sich damit auch für Knaben der Forderung nach Halbtagsschichten, die er für die weibliche Jugend verlangt, und die wohl geeignet sind den Eintritt ins Erwerbsleben zu einem allmählichen zu gestalten. Auch der Forderung Kaups nach einem 2 wöchentlichen Sommerurlaub wird man beistimmen müssen.

Die Arbeit Jugendlicher ist in allen Betrieben, in denen giftige Substanzen entstehen, erzeugt oder verwendet werden, zu untersagen, da der jugendliche Organismus einerseits für Giftstoffe besonders empfänglich ist, anderseits von Jugendlichen nicht jene Vorsicht und jene strenge Durchführung der persönlichen Prophylaxe erwartet werden kann, die in solchen Betrieben notwendig ist.

Weitergehenden Schutz als männliche jugendliche Arbeiter bedürfen junge weibliche Arbeiter. Für diese sind die Jahre der Pubertät besonders kritische, die Vorgänge, die zur Entwicklung der Geschlechtsreife führen, erschüttern den weiblichen Organismus weit mehr als den männlichen, die Sterblichkeit des weiblichen Geschlechtes, die im allgemeinen eine günstigere ist als die des männlichen, ist gerade in den späteren Entwicklungsjahren in manchen Ländern eine grössere (Tabelle nach Westergaard). Aber auch in jenen Ländern, in denen im Gegensatz zu England und ähnlich wie in Norwegen die Gesamtsterblichkeit des weiblichen Geschlechts in den Jahren 15–20 kleiner ist als die des männlichen Geschlechtes, (in Preussen und Bayern) ist die Tuberkulosesterblichkeit in diesen Jahren beim weiblichen Geschlecht grösser (Tabelle nach Prinzing).

Von 100,000 in Alten X lebenden starben.

[Nach Westergaard.]

	England.		Norwegen.	
	Männer.	Weiber.	Männer.	Weiber.
10 Jahre	195	167	471	529
11 Jahre	177	156	454	484
12 Jahre	181	167	441	473
13 Jahre	203	197	450	481
14 Jahre	240	241	453	506
15 Jahre	287	295	505	523
16 Jahre	338	351	552	527
17 Jahre	386	401	651	546
18 Jahre	425	441	775	560
19 Jahre	456	469	854	564
20 Jahre	480	489	912	564
21 Jahre	502	506	958	624
22 Jahre	526	524	1,006	635
23 Jahre	557	550	987	640
24 Jahre	594	583	936	680

Auf 100,000 Lebende kamen Todesfälle an Tuberkulose der Lunge und anderer Organe.

[Nach Prinzing.]

Alter.	Preussen, 1896–1900.		Bayern, 1899–1901.		Schottland, 1891–1900.		Italien, 1897–1900.		Schweiz, 1881–1890.	
	Männer.	Weiber.	Männer.	Weiber.	Männer.	Weiber.	Männer.	Weiber.	Männer.	Weiber.
5–10 Jahre	37	50	67	90	103	121	82	104	90	119
10–15 Jahre	46	83	54	108	85	153	54	116	173	291
15–20 Jahre	147	160	163	219	214	277	140	236	340	363
20–30 Jahre	266	233	341	336	326	307	244	277	402	339
30–40 Jahre	290	261	378	364	299	305	.....	.....	.....	.....

Ich habe bisher stets von Altersgrenzen gesprochen: Eine Altersgrenze, unterhalb der kindliche Arbeit verboten, oberhalb der sie—und zwar zunächst nur in beschränktem Masstabe—gestattet sein soll, während erst von einer weiteren Grenze an der Arbeiter als voll leistungsfähiger Arbeiter anzusehen ist. Es könnte nun eingewendet werden, dass bei den so ungemein grossen Verschiedenheiten, die zwischen den einzelnen Individuen bestehen, die Festsetzung einer Altersgrenze eine allzu schematisirende Massregel ist, dass einer solchen Festsetzung eine Bestimmung, die die Beschäftigung eines Kindes—ohne Rücksicht auf sein Alter—von der Beibringung eines ärztlichen Zeugnisses abhängig macht, vorzuziehen wäre. Mehrere Momente aber müssen eine derartige Regelung der Frage der Kinderarbeit als unmöglich erscheinen lassen: Zunächst wäre dadurch ein allzu grosser Spielraum der individuellen Ansichten des einzelnen Arztes gegeben, allzu sehr würden bei der Entscheidung die persönlichen Ansichten des einzelnen Arztes über Schwere der Arbeit, Wirkung der Arbeit auf den kindlichen Organismus ins Gewicht fallen; dann ist es auch für die Eltern wichtig, von vornherein zu wissen, von

welchem Jahre an ihre Kinder sich ihren Lebensunterhalt ganz oder teilweise zu erwerben im Stande sein werden; vor allem aber müssen die Bestimmungen über Schulpflicht und über Kinderarbeit in einander greifen, es muss dafür gesorgt sein, dass das Kind während der Dauer der Schulpflicht von Gewerbsarbeit möglichst ferngehalten werde, anderseits aber muss dafürgesorgt sein, dass—so lange das Kind zur Erwerbsarbeit nicht zugelassen wird—es in der Schule Beschäftigung findet.

Von diesen Erwägungen ausgehend, ist man wohl überall zur Festsetzung von Altersgrenzen gelangt. Vom hygienischen Standpunkte aus, sowie mit Rücksicht auf das eben erwähnte möglichst allgemein durchzuführende Ineinandergreifen von Dauer der Schulpflicht und Schutzalter, erscheint es notwendig, das Schutzalter so hoch anzusetzen, dass bei Erreichung der Altersgrenze jedes Kind—von seltenen Ausnahmen abgesehen—wenigstens für irgend einen Beruf, wenigstens insoweit arbeitsfähig ist, als das Gesetz die Arbeit gestattet.

Soll nun nach Erreichung dieses Alters die Zulassung zur Arbeit überhaupt, zur Arbeit in einer grossen Gruppe von Betrieben oder zur Arbeit in bestimmten Berufen von dem Ergebnis einer ärztlichen Untersuchung abhängig gemacht werden?

Bei entsprechend hochgestelltem Schutzalter erscheint es überflüssig, die Zulassung zur Erwerbsarbeit im allgemeinen von einer ärztlichen Untersuchung abhängig zu machen. Bei niedrig gestelltem Schutzalter und damit in Zusammenhang stehender frühzeitig beendigter Schulpflicht, würde die praktische Durchführung der vom Arzt verfügten Fernhaltung von Erwerbsarbeit auf die grössten Schwierigkeiten stossen.

Bei hochgestelltem Schutzalter wäre es auch überflüssig die Zulassung zu einer grossen Gruppe von Betrieben, z. B. wie es das englische Gesetz vorschreibt, für alle Fabriken (und ausserdem für einige Arten von Werkstätten) von einer ärztlichen Untersuchung abhängig zu machen. Auch kann ich mich wenigstens nicht des Gedankens erwehren, dass die Kinder, die auf Grund der Verweigerung eines ärztlichen Zeugnisses zu dem weitaus grössten Teil der Erwerbsmöglichkeiten, z. B. zur Fabriksarbeit nicht zugelassen werden, dann Beschäftigungen anderer Art suchen und finden, die für ihre Gesundheit oft noch weniger zuträglich sind, Arbeiten in Werkstätten, in der Heimarbeit und beim Strassenhandel. Es besteht die Gefahr, dass bei auf so grosse Gruppen von Betrieben ausgedehnter obligatorischer und streng durchgeführter Untersuchung gerade die Schwächlichen in schlecht bezahlte und hygienisch ungünstige Berufe gedrängt werden.

Es sind vielleicht Erwägungen dieser Art, sowie der Umstand, dass die Untersuchungen erst, nachdem das betreffende Kind einen Arbeitsplatz gefunden

hat, vorgenommen werden, die dazu führen, dass die Zahl der von den englischen certifying surgeons vorgenommenen Zurückweisungen eine recht geringe ist. Von 423.195 Untersuchten (1910) wurden 13.203 zurückgewiesen, von diesen jedoch nur 8,469 aus medizinischen Gründen, zu denen auch "Mangel an Reinlichkeit" (in 3.962 Fällen) gerechnet wird, so dass von 423,195 Untersuchten aus medizinischen Gründen im engeren Sinne nur 4,507- 1.06 Prozent zurückgewiesen wurden. Bemerkenswert ist, dass seit 1901 die certifying surgeons das Recht haben, die Tauglichkeitserklärung an Bedingungen zu knüpfen und dass viele von ihnen—wie aus den Berichten Deardens und Glen Park's auf dem Brüsseler Congress für Gewerbekrankheiten 1910 hervorgeht- in höchst anerkennenswerter Weise ihre Tätigkeit nicht auf die Ausstellung von Zeugnissen beschränken, sondern den Untersuchten, besonders wenn sie irgendwelche Mängel zeigen, Ratschläge für Ergreifung einer geeigneten Beschäftigung geben.

Notwendig aber erscheint es mir, die Zulassung zu bestimmten Berufen oder Beschäftigungszweigen, die besondere Ansprüche an die Körperkräfte oder die Widerstandsfähigkeit und Gesundheit einzelner Organe stellen, von dem Ergebnis einer ärztlichen Untersuchung abhängig zu machen. Als solche Berufe wären anzusehen: Hüttenarbeiter, Schmiede, Steinmetze, Bäcker, Arbeiter in Giftbetrieben und einige andere Arbeitergruppen. Die Zahl dieser Berufe aber sollte eine sehr beschränkte sein und eben nur jene umfassen, die ganz besondere Anforderungen an den Organismus stellen. Für diese Beschränkung auf wenige Berufe sprechen zwei Momente. Vor allem ist es sehr schwierig bei einem 14- oder 16jährigen eine Prognose über seine weitere körperliche Entwicklung zu stellen, von dieser Prognosenstellung aber hängt, sobald die Untersuchung nicht die Auslese nur ganz besonders kräftiger zum Zwecke hat, unsere Entscheidung ab. Dann aber wird bei weiterer Ausdehnung der obligatorischen Untersuchung und ihrer strengen Handhabung der Arbeitsmarkt für die Schwächlichen allzusehr eingeschränkt und diese werden, wie wir ja bereits oben erwähnt, dann in Berufe gedrängt, die für sie oft schädlicher sind als die, aus denen wir sie ausschliessen.

Bin ich so der Meinung, dass die Beibringung eines Tauglichkeitszeugnisses nur in sehr beschränktem Umfange obligatorisch gemacht werden soll, so halte ich es anderseits für wünschenswert, dass das Moment der körperlichen Eignung mehr als bisher bei der Berufswahl Berücksichtigung finde.

Heute treibt zwar, wie Dr. M. Winter in seinem Bericht über die Tätigkeit der Schulärzte an den gewerblichen Fortbildungsschulen ausführt (Österreichisches Sanitätswesen, 1911) die "natürliche Berufswahl" den Kräftigen zum Schmiedehammer, während der schwächliche zur Nadel greift, und auch die Lehrherren und Arbeitgeber üben eine gewisse oberflächliche Auslese—Krankheiten aber, die dem Arbeitsuchenden selbst unbekannt, z. B. gut compensirte Herz-

fehler und körperliche Abnormitäten, die dem Betreffenden noch keine Beschwerden verursachen, die aber gerade durch Ausübung eines bestimmten Berufes sehr gesteigert werden können und dann heftige Beschwerden machen (z. B. Plattfüsse bei Kellnern und Drechslern), finden bei der Berufswahl keinerlei Berücksichtigung. Es sollte dafür gesorgt werden, dass neben allen oft recht berücksichtigenswerten Momenten, die heute für die Berufs "wahl" massgebend—oft spielt der Zufall dabei die grösste Rolle—auch die körperliche Eignung Berücksichtigung finde.

Ich stehe seit drei Jahren einer ärztlichen Beratungsstelle für die Berufswahl vor, für die in Arbeiterkreisen lebhafte Propaganda gemacht wird. Doch kann durch solche Einrichtigungen der nach dieser Richtung bestehenden Gleichgiltigkeit nicht wirksam entgegengetreten werden. Hier ist ein Eingreifen der Schule notwendig. Die vor Vollendung der Schulpflicht stehenden Knaben und Mädchen sind vom Lehrer auf die Wichtigkeit der körperlichen Eignung für die Berufswahl aufmerksam zu machen, und der Schularzt, der ja die meisten Schüler seit langem kennt, ist der berufene Ratgeber. In einzelnen deutschen Städten wird dieser Vorgang eingehalten. Wo Schulärzte nicht angestellt sind, wäre wenigstens für Untersuchung und Beratung der vor Schulaustritt stehenden Schüler ein Arzt zu bestellen. Der Arzt hätte dann durch im Bedarfsfalle eindringliche Belehrung dafür zu sorgen, dass die körperliche Beschaffenheit des Schülers bei der Berufswahl berücksichtigt wird, wobei er sich allerdings wird vor Augen halten müssen, dass körperliche Eignung zwar ein wichtiges Moment, aber keineswegs das einzige oder allein zu berücksichtigende ist. Nur dann aber wird der Arzt ein nützlicher Berater sein können, wenn er über die verschiedenen Berufe und Arbeitsverrichtungen aus eigener Anschauung genau unterrichtet ist. Hier genügen nicht allgemeine medizinische Kenntnisse, auch nicht allgemeine gewerbehygienische Kenntnisse, sondern der Arzt, der hier nützlich wirken will, muss über genaueste Kenntnis der Arbeitsverhältnisse und der Werkstättenverhältnisse in den einzelnen Berufen verfügen und er muss auch wissen, zu welchen Arbeitsverrichtungen Jugendliche in den einzelnen Berufen vor allem herangezogen werden. Solche Kenntnisse aber können nicht aus Büchern geschöpft, sie müssen durch eigene Anschauung erworben werden.

THE LABOR AND WORK OF CHILDREN SHOULD BE ADAPTED TO THE INDIVIDUAL CHILD.

THOMAS MORGAN ROTCH, M. D., Boston.

A great deal of thought has been given to and work done on the subject of determining how the early years of life can be classified into divisions for various purposes—educational and physical. Divisions, however, that have so far been made are rather unsatisfactory and have often been based in great measure upon the chronologic age of the individual. When we consider how greatly individual children differ from each other in mental and physical development, even though they may be of about the same chronologic age, it becomes apparent that a much broader method of classification is necessary if we expect to do justice to the capabilities, both mental and physical, of the individual child.

It is well known from a medical point of view that mental and physical conditions should not be overstrained by being brought into use before the development adapted to such use is established; and, on the other hand, that functions, both mental and physical, are weakened by not being brought into use when they are ready to be used.

If we assume that it is the individual whose welfare should be looked after as to the time when he should begin to work and the kinds of work which he should be allowed to do, a number of factors must be considered in the problem. First of all, it should be understood that the mental condition of the individual child should be carefully determined, in order to decide whether it is such that he should be allowed to work at all. Taking for granted that the mental condition and the degree of knowledge attained, according to his probable future vocation, justify the individual in beginning to work, the problem to be solved is whether his physical condition is such that work will not harm him.

It should be impressed upon educators and upon those who determine the physical fitness for labor that when the degree of mental development and general health is satisfactory, and it has been decided that labor should be begun, the kind of labor itself should be classified and the individual should be allowed to undertake the degree of labor which is best adapted to his physical condition.

What I am about to say I have already stated in part in previous publications, but I am taking the liberty of repeating somewhat, as this paper is to be presented largely to a new audience. I am also stating my views regarding the grading in schools, because the two conditions, mental and physical, at all ages up to adult development seem to be so closely allied.

Assuming that some additional means of classification is necessary in order to obtain the greatest good for the greatest number, a few words in regard to the classifications now used are desirable. It is well to say, however, that the advanced methods of determining mental development are not here under discussion, since the physical side of the question is now being dealt with. There is little doubt, however, but that mental and physical development are closely associated.

Former classifications have been based largely upon chronologic age, upon the weight and height, and upon the development of the teeth. In regard to the latter the consensus of opinion among odontologists is that the eruption of the teeth, as an index of either chronologic or anatomic age, is illusive. It is well known that tables compiled to show the average weight and height of individuals at certain ages are misleading in particular instances where great differences are manifest in well, strong children of the same age. The various forms of examination for the determination of the physical condition of an individual should be used as at present, and it is not my intention in this paper to go into a detailed discussion of these forms, or in any way to criticise their utility. A greater or less height or weight, according to race, family, or environment, than that which is found to correspond to the average age, may or may not indicate some abnormal condition, but in the general determination for fitness for work these factors of the problem have an important bearing on the final result. In like manner any irregularity in the development of the teeth has its own special significance. The normal or abnormal condition of the bones, the chest expansion, and the muscular strength all have an important bearing on the solution of the problem as to the fitness of the individual to begin physical work.

The important point to be borne in mind is that we must determine the fitness of each individual for school and physical work in the early years of life, and that the former basing of the grades in school and the fitness of the individual to do certain grades of work, upon chronologic age is insufficient. Although in numbers of cases children of the same chronologic age can be safely placed in the same grade in school, this wholesale classification has in many cases proved to be inadequate where, as is only right, we are endeavoring to provide for the good of the individual.

The object to be attained in grading for the schools is the keeping, so far as is possible, the mental and physical development in equipoise. If a child is found, by the examinations already made use of in the grading in the schools, to be mentally much in advance of his physical development, special care should be given to him and he should be kept back in his studies, rather than advanced, until it is ascertained that his mental condition is not being overtaxed. If,

on the other hand, the physical is about equal to the mental development, there is not much danger of overtaxing the brain, and not so much care in supervision is required. If the physical is evidently ahead of the mental development, there will probably be no danger of overtaxing the brain. Again, if there is an advanced mental development, and with it a correspondingly advanced physical development, the individual should be allowed to be placed in a grade above that in which, according to his years, he would usually be placed. It is the very bright children of a low grade of physical development of whom we should be especially careful in advancing in the grades in school. Masters in the schools have told me that it is impossible, when grading the children, to say which child will eventually have to be withdrawn from school or placed in a lower grade on account of a physical breakdown, and they are most desirous of obtaining some additional method of examination which will aid them in determining which children would be likely to break down, and would consequently require special care in grading.

In like manner, in regard to labor, the individual with an undeveloped physical condition should not be allowed to enter upon work which has been determined to be proper for a given age, whether he is of such age or not. In certain classes of work, as in the Naval Academy, at Annapolis, it has been found impossible, with the usual means of physical examination, to determine which men will prove, after a year or two, to have been unfit to have entered upon the work of the school. This has been shown by their lack of physical endurance, which has necessitated their being dropped from the academy or into a lower class, thus involving a loss of time to themselves and unnecessary expense to the Government.

Another reason why the basing of our grades of classification upon chronologic age alone is insufficient is the fact that the real age of many children in our country is not known. The fact is that each child should be a law unto itself, and this can be accomplished only by a knowledge of the physical conditions of the special child. It is well known that parents and guardians, in many cases anxious that their children should obtain work, by which they will become wage earners, falsify the ages of their children over and over again. Such falsification can not play its pernicious rôle when the word of such parents and guardians is set aside and the child's actual physical condition has been determined. It has, indeed, been brought to my attention by mill owners that they have great difficulty in keeping unsuitable children out of the mills when they have reached, according to their parents, an age when the law allows them to begin work. In Massachusetts there is a law requiring every child to present a certificate of birth before receiving a working certificate, and in Boston

there is a regulation of the school board requiring every child to present a certificate of birth upon entering school.

It is evident, therefore, that some additional aid for determining the fitness of an individual, either for his school or physical work, beyond the usual examinations for fitness, is required. With this in mind, I have for some years been making a study of additional means for determining the relation of physical fitness to certain degrees of labor and to school work. I have done this with the view of protecting the individual child, always taking into consideration the importance of recognizing what a great rôle in normal development is played by fresh air, general hygiene, and protection from mental overstrain.

The close relation which is known to exist between physical growth and the development of the epiphyses led me to make some investigations by means of the Roentgen ray on the living anatomy of early life during the different stages of development. A study of a large number of cases with Dr. A. W. George, roentgenologist to the Children's Hospital, showed that under normal conditions all the centers of ossification progressed with comparative regularity, and that the degree of development of the wrists and hands represented, to a fair degree, that of the entire bony framework. This correspondence of the development of the wrists and hands to that of the rest of the skeleton is especially fortunate, as it is evident that the wrists and hands are the most available parts for routine examination in large numbers of cases. This anatomic relation has been substantiated by Prof. Pryor, of Lexington, Ky. In connection with this a criticism as to the occasional difference in the development of the two hands has been made, but Pryor has stated, after an extensive study of the development of the epiphyses, that where one difference occurs very many points of similarity exist, showing the uniform development not only of the hands, but of all the epiphyses. We can say, therefore, that the hands and wrists can practically be used as a fairly safe guide of epiphyseal development.

Before speaking of the practical use which can be made of the series of representative stages of development, which I am suggesting for the purpose of simplifying the question of labor, it will be well to mention in review certain anatomic facts. These facts, which I have deduced from my own work on about 600 cases, have been substantiated by a number of other observers. As a rule no centers of ossification of the carpal bones or of the epiphyses of the radius, ulna, metacarpal bones, or phalanges are present at birth, but there is a progressive appearance of these ossific centers from birth to the completion of development. While the appearance in succession and the development of the carpal bones and the epiphyses

of the radius and ulna, with the epiphyses of the metacarpal bones and phalanges as controls, best provide a developmental series for the first 12 or 13 years of life, the different degrees of ossification up to complete union of the epiphyses of the radius, ulna, metacarpal bones, and phalanges provide the most practical series for grading through adolescence to adult development. We have, therefore, two distinct groups of stages of development which we can use for the grading of human beings from birth to adult life.

In the first group the following order of appearance is met with normally in a large majority of cases, but it is to be noted that it is not only the appearance of the bones which represents progressive growth, but also their increase in size and their massing. The os magnum appears first, then the unciform, then the epiphysis of the radius, then the cuneiform, and then the semilunar. The order of the appearance of the next ossific centers differs without being necessarily abnormal and, in fact, it is probable that it is the number of ossific centers present rather than special ones which indicate advancing development. Thus, while in my series of cases the trapezium or the scaphoid appears next, followed by the trapezoid, Pryor finds that there is some variation in the appearance of the scaphoid, trapezoid, and trapezium, but that usually the trapezoid comes before the trapezium. We can say, however, that after the semilunar the scaphoid comes and then either the trapezoid or trapezium, one following the other. After these eight ossific centers comes the epiphysis of the ulna. There is then for a considerable period an enlarging of the epiphyses and an enlarging and massing of the carpal bones and finally the pisiform bone appears.

It is well to state here that we must take into account in arriving at conclusions as to grades of development of the epiphyses that careful investigation should be made as to whether the hands and wrists have at any time been affected by articular congestion which might produce abnormal conditions of size and appearance.

The following pictures (Pls. A to P) of a series of my cases illustrate the first group. It should be understood that these pictures represent stages of anatomic development and, although I have indicated the age and sex for future reference, that these chronologic ages are incidental. Pryor's table, which will appear later, can be used as a basis for further study of chronologic age as corresponding to anatomic age.

Although in many cases mere age does not indicate development, yet Pryor's table, which corresponds to my own observations, gives useful information of a great deal of practical value.

Pryor's table.—Development of the wrist according to sex.

Sex.	Age in years.	
Female	½	A. Magnum, unciform.
Male	1	
Female	1½	B. Magnum, unciform, radius (lower epiphysis).
Male	2	
Female	2½	C. Magnum, unciform, radius, cuneiform.
Male	3½	
Female	3½	D. Magnum, unciform, radius, cuneiform, semilunar.
Male	4½	
Female	4½	E. Magnum, unciform, radius, cuneiform, semilunar, and one of the following: Scaphoid, trapezoid, trapezium.
Male	5½	
Female	4¾	F. Magnum, unciform, radius, cuneiform, semilunar, and two of the following: Scaphoid, trapezoid, trapezium.
Male	5¾	
Female	5½	G. Magnum, unciform, radius, cuneiform, semilunar, scaphoid, trapezoid, trapezium.
Male	6¾	
Female	6¾	H. Magnum, unciform, radius, cuneiform, semilunar, scaphoid, trapezoid, trapezium, ulna (lower epiphysis).
Male	7½	
Female	7½	I. Same as H, but more advanced.
Male	9	
Female	8½	J. Same as I, but more advanced.
Male	10	
Female	10½	K. Magnum, unciform, radius, cuneiform, semilunar, scaphoid, trapezoid, trapezium, ulna, pisiform.
Male	12¾	

We now come to the second group, the earlier stages of which can be used to aid us in determining whether the individual has arrived at a period of development when he will not be harmed by beginning to work. The latter stages of this group can be used in determining the fitness of an individual for different degrees of work represented by vocation. Here, in accordance with the rule that the later the appearance of an epiphysis the earlier the union, we must remember that the rule for union is, first, the epiphyses of the distal phalanges, then those of the metacarpals, then those of the other phalanges, then the epiphysis of the ulna, and finally that of the radius. It is thus seen that the changes in the ossification of the epiphysis of the radius play the most important rôle in the second group as, appearing first, it unites last, showing progressive changes up to adult development.

It will take much further investigation and careful study of a large number of cases in order to determine the progressive stages of development in the second group to the degree that has been done in the first group, where the successive stages are much more simple. The fact, however, remains that a knowledge of the different stages of development in the second group is of importance in a preliminary examination. My observations in this group have been too few to warrant my giving them as a standard, but for the purpose of aiding future investigators, I give here Prof. Pryor's conclusions as to the times of union of the epiphyses of the wrist and hand:

Union of epiphyses (Pryor).

Lower epiphysis of radius:
Female, 17 to 18 years.
Male, 20 to 21 years.

Lower epiphysis of ulna:
Female, 16 to 17 years.
Male, 19 to 20 years.
Epiphyses of the metacarpal bones:
Female, 15 to 16 years.
Male, 17 to 18 years.
Epiphyses of the phalanges:
Female, 15 to 16 years.
Male, 17 to 18 years.

The distal epiphyses unite first, next the metacarpal, then those of the first row of phalanges, and then those of the second row of phalanges.

The following pictures are illustrative of certain grades of development in the second group, irrespective of age, and presupposing that intermediate grades of development can be introduced when further study warrants such addition:

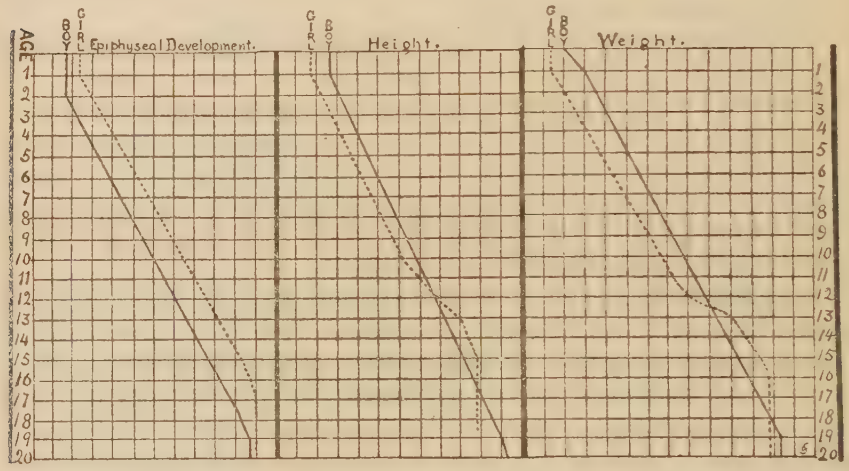
In connection with a Roentgen examination of an individual, it should be borne in mind that while boys are usually heavier and taller at birth than are girls, at the period of puberty the girl overtakes, in height and weight, the boy of the same age. She surpasses him and becomes a developed woman before the boy becomes a man, when he, in turn, overtakes and surpasses the woman. It is, of course, well known that these periods of growth vary in the individual according to zone, race, and environment.

The following chart, without attempting to illustrate the finer details of weight and height in pounds and feet, shows how the lines, representing the weight and height of boys and girls, cross each other. These lines are shown so well by Camerer that I have taken his charts as illustrative and to compare with my own chart of epiphyseal development. The girl's growth is shown by a broken and the boy's by an unbroken line. The girl's weight line is seen to cross the boy's at about the 13th year, and the boy's to cross the girl's at about the 17th year. The lines of height show about the same relation as do those of weight. On examining the lines which represent epiphyseal development, it will be noted that such development in girls is, from the very first year of life, in advance of that of boys, and remains ahead up to the time when the epiphysis of the radius becomes fully united, thus being in striking contrast to the lines of weight and height. This union, according to Pryor, takes place at about the 17th or 18th year in females and at about the 20th or 21st year in males, thus showing that, anatomically, the girl becomes a mature woman earlier than the boy becomes a man. These lines emphasize the lack of correlation between epiphyseal growth and general physical development.

It would seem, therefore, that in grading individuals from birth to the completion of development, the epiphyseal development should

play a prominent part; also that the individual's general welfare depends to a certain degree on keeping its mental and epiphyseal development in equilibrium, thus avoiding overstrain, whether mental or physical. This difference in development also suggests that, in grading the two sexes, we should have either a separate curriculum for the sexes, or one curriculum adapted to certain stages of epiphyseal and mental development for both sexes.

This advanced development of the girl is strikingly shown in the case of twins, where the epiphyseal and carpal development is similar when the twins are of the same sex, but dissimilar when the twins are of opposite sex. Plates I and II show the similarity in development of the hands of twin girls. Plates III and IV show the advanced development of the girl in the hands of twins, a boy and a girl.



The following are some illustrative examples of the use of the Roentgen method of examination in connection with labor: Plates V and VI, given to me by Prof. Pryor, represent the hands of two young men of 17 years. Plate V shows a lack of ossification of the epiphyses of the radius, ulna, metacarpal bones, and phalanges, so marked and corresponding more to the later stages of the first group, that we are at once warned that he should be examined and graded with unusual care as to his work, in order to protect him from loss of valuable time in his vocation. He should not be allowed to undertake the higher grades of labor, which are liable to break him down, before he is ready to undertake them with safety. This young man should normally show a greater degree of ossification of the radius and ulna and, according to Pryor, union should have taken place in the epiphyses of the metacarpal bones and phalanges. Plate VI, on the contrary, shows such complete union of the epiphyses of the metacarpal bones and phalanges, as well as those of the radius and

PLATE A

GIRL, AGED 6 MONTHS.

GIRL, AGED 2¾ YEARS.

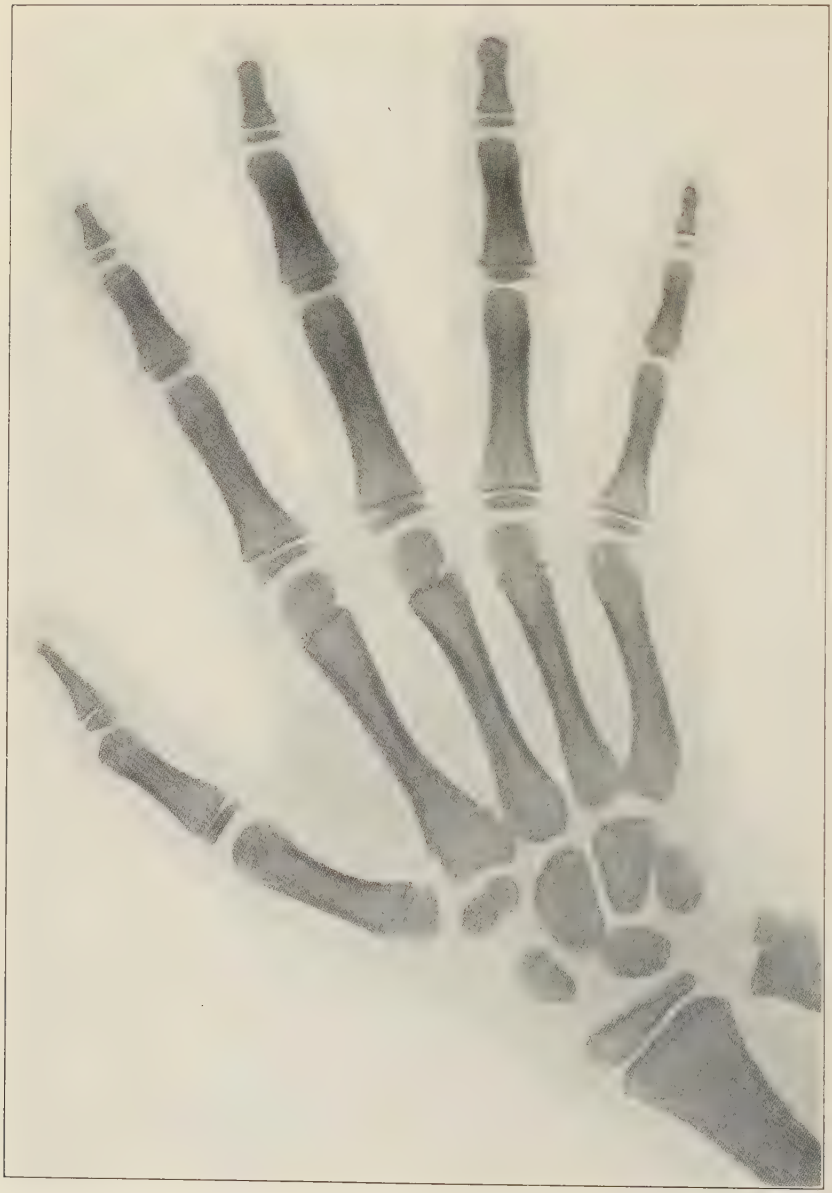
GIRL, AGED 3¾ YEARS.

BOY, AGED 2¾ YEARS.

GIRL, AGED 3½ YEARS.

GIRL, AGED 5½ YEARS.

GIRL, AGED 6½ YEARS.



GIRL, AGED 6 YEARS.

GIRL, AGED 6¾ YEARS.

GIRL, AGED 8½ YEARS.

GIRL, AGED 11¼ YEARS.

GIRL, AGED 12¾ YEARS.

BOY, AGED 13½ YEARS.

MALE, AGED 14½ YEARS. OSSIFICATION OF RADIUS BEGUN.

MALE AGED 18 YEARS. OSSIFICATION OF RADIUS ADVANCED.

MALE, AGED 19 YEARS. OSSIFICATION OF RADIUS ABOUT COMPLETED.

GIRL, AGED 6 YEARS AND 7 MONTHS. TWIN SISTER OF GIRL, PLATE II.

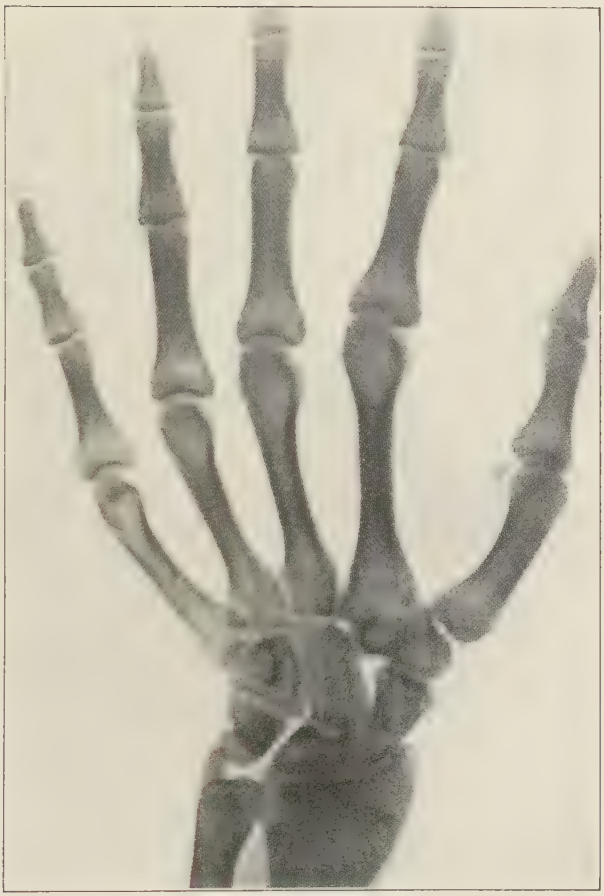
GIRL, AGED 6 YEARS AND 7 MONTHS. TWIN SISTER OF GIRL, PLATE I.

BOY, AGED 5 YEARS AND 3 WEEKS. TWIN BROTHER OF GIRL, PLATE IV.

GIRL, AGED 5 YEARS AND 3 WEEKS. TWIN SISTER OF BOY, PLATE III.

MALE, AGED 17 YEARS AND 7 MONTHS.

MALE, AGED 17 YEARS AND 2 MONTHS.



MALE, AGED 15 YEARS.

ulna, that he at once suggests fitness for adult labor, and if the other examinations, mental and physical, are satisfactory, little apprehension need be entertained as to physical overstrain.

Plate VII represents the hand of a young man who entered college with honors at 11 years. He had no difficulty in keeping up with his classmates of 18 or 19 years and was graduated with a cum laude. When seen by me at 15 years, he was taking an advanced course with men 22 and 23 years of age, and showed no mental fatigue. His anatomic development shows a very advanced stage of ossification, and, although an unusual case, he illustrates the general principle of grading an individual according to his mental and physical condition, rather than according to his age. With his mental and physical development in equilibrium, he has been provided by nature with an equipment so far above that of the average boy of his age that he has a right to be benefited by advantage of time in his vocation. It would seem that he should not be prevented by an arbitrary law of age from entering upon some such career as, for instance, that offered at the United States Naval Academy, from which he would be excluded on account of his age, 15 years. The minimum age limit at the academy is 16 years. This advanced stage of development will be seen in the plate, which shows union of all the other epiphyses, and almost complete union of the epiphyses of the radius and ulna.

It may be said here that a routine Roentgen examination of the wrists and hands is now being made as a part of the general physical examination at the United States Naval Academy at Annapolis.

Teachers and those who regulate the grading of individuals in connection with labor should have it impressed upon them that the Roentgen method of examination is not so difficult and complicated as may at first appear. They should be made to understand that the use of the Roentgen ray in this connection is not the introduction of an exact method, but that it is an aid, and a valuable one, in determining how an individual should be graded.

The details of when and where these pictures should be taken would have to be decided upon by practical people who are recognized as organizers. It should be understood that the pictures can be taken in a few seconds and, when the details are once systematized, much more rapidly than can be accomplished in ordinary photography. Central places, which could be used for quite large areas of habitation, should be determined upon as fit for the installation of a Roentgen-ray machine. A large number would not be necessary, and the expense would not be very great. The space required for such a machine is small, and could be obtained in any of the schoolhouses or public buildings. It would not require an especially expert Roentgenographer to determine the number of carpal bones or the general degree of ossification of the epiphyses. Anyone who could

take a moderately good Roentgen picture would be able to determine this at once.

Prints of the hands of each individual should be taken from time to time and kept on file with the other records of examination. By comparing earlier and later pictures and by observing any changes or lack of changes information would be obtained as to whether an individual is developing or not. What the Roentgen picture really does is to put the examiner on the right track by pointing out to him the different degrees of anatomic development, thus quickly directing his attention to the proper grading of the individual. I would again emphasize the principle that the mental and physical development should be kept as nearly as possible in equilibrium, it being the correspondence of the two which will best fit the individual for his special vocation.

Finally, we must not be misled by thinking that the development of the epiphyses always represents the actual, general, physical strength. The muscles may be weak, but such a condition should be considered abnormal, and the individual should be treated as abnormal and should not be classified by the degree of strength which he shows. On the other hand, the carpal bones and the epiphyses of the radius, ulna, metacarpal bones, and phalanges indicate what the development really is and has been, and the muscular strength and endurance should be worked up to the degree of development shown by the anatomic condition present.

SUMMARY.

1. Chronologic age and physical condition do not necessarily correspond.

2. The individual should be graded according to his physical and mental conditions and not according to his chronologic age alone.

3. A valuable aid as a basis for determining the physical condition is the anatomic development.

4. A study of anatomic conditions shows that the hands and wrists present progressive stages of development from birth to the completion of ossification and correspond in their development to the rest of the skeleton.

5. A further study shows that these stages of development can be divided into two groups, one in a general way corresponding to the elementary school period and the other covering more advanced school periods and those of labor and vocation.

6. Labor and vocation should be graded, and the individual should be allowed to undertake the grade of labor, as well as the degree of mental work, to which he is best adapted.

7. In order to get the best results in the grading of human beings, the mental and physical conditions of the individual should be kept in equilibrium.

FRIDAY MORNING, SEPTEMBER 27, 1912.

THE EFFECTS OF MONOTONOUS TOIL IN THE YEARS PRECEDING ADOLESCENCE.

MARGARET MCMILLAN, member of the school board, Bradford, England, manager (schools) London County Council.

Before speaking of the effect of monotonous toil in the years preceding adolescence one must make some allusion to that interesting period of life—so short as to be imperceptible and perhaps nonexistent as yet in some races, but prolonged in the white children of the West over a period of years. It is fitting that America, the New World, should have produced thinkers devoted to the study of this latest period of human growth. How thrilling its problems are, how new and charged with fate, these teachers have set forth already in their writings. If no further allusion is made to such workers as Stanley Hall, that is because we are concerned with a lesser problem—the effect of monotonous toil in the years preceding adolescence.

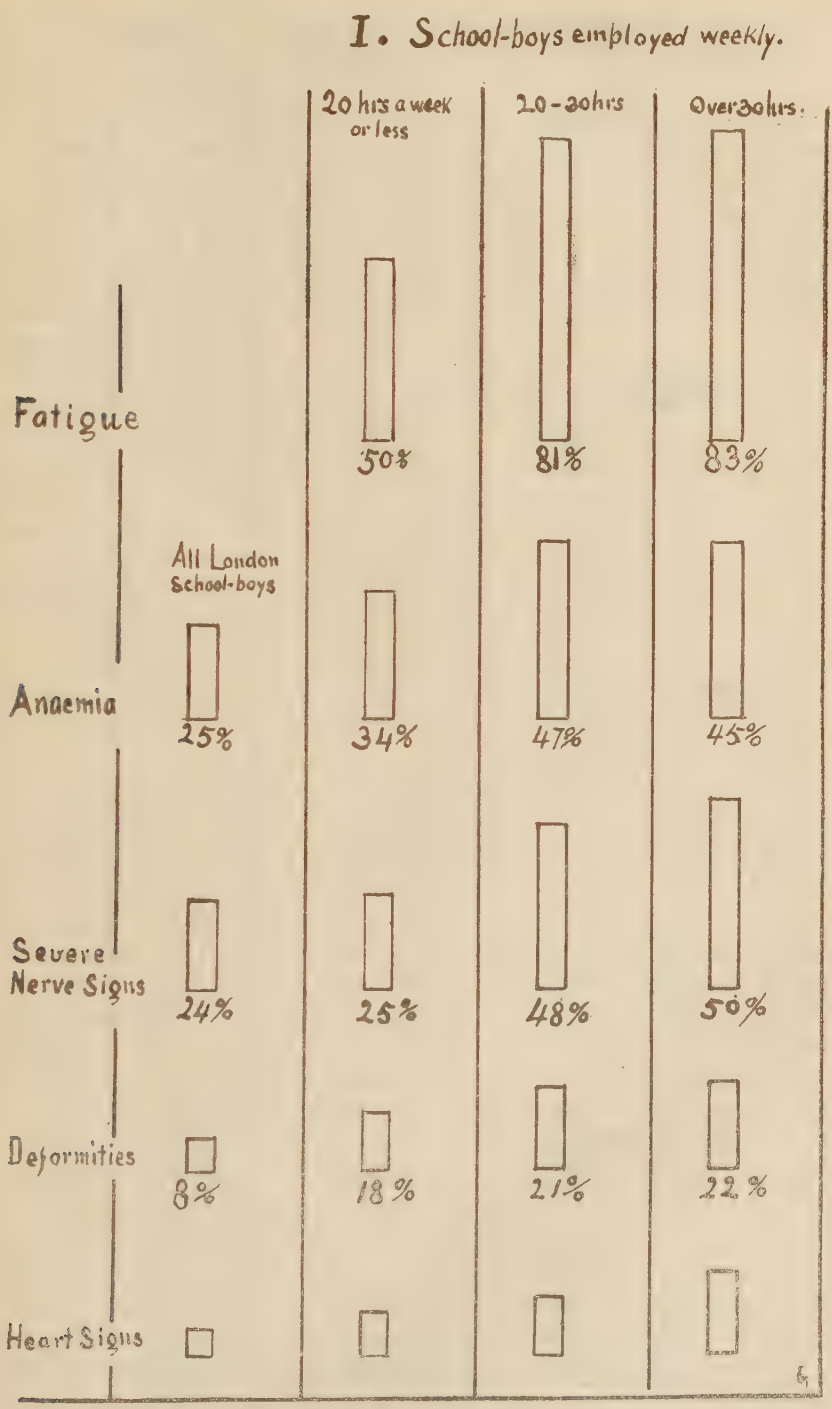
Though the years just before adolescence have characteristics of their own, yet parallels to the events of every period of life may be traced in earlier stages. The conscious life of a young child, for example, is concerned with the functioning of nerve cells that later will act automatically. The rapid progress he makes does not veil, but rather makes plain, the fact that a travail of adaptation is going on and that the stress and voluntary effort of later years has its parallel in infancy. Swiftly as we pass through these earlier crises in growth and impossible as it is to describe them accurately, there is little doubt that we may trace in them the beginning of conscious effort.

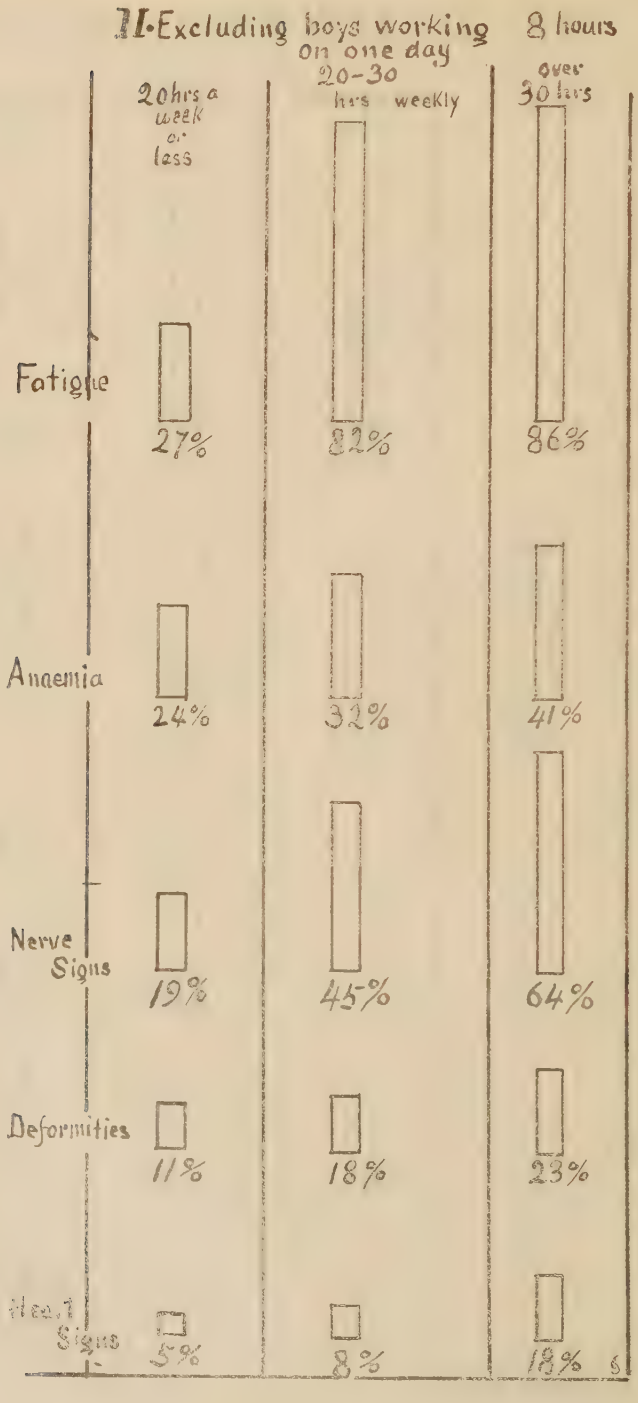
Monotony at this early age would be fatal—so fatal as to render humanity itself impossible. The young child is guarded from it in many ways. To begin with, he is greedy for sensation, and seeks for it in all his waking hours. Then he is not only born into a new and virgin world, whose commonest objects awaken and satisfy his craving for new experience. He is born into a civilization which multiplies on all hands the appeal of the physical world, and even creates new worlds with manifold appeals and power of expression. Last, but not least, the young child's weakness safeguards him. He can not be set to monotonous work in his infancy. In England it was found necessary to wait, even in the darkest days of child labor, till he was 4 years old before thrusting him into the factory. I do not say that the infant of 3 or 4 years old is always completely safeguarded even now. In the worst quarters of our slums, and rarely in other places, one may yet see babies who suffer from monotony.

They are locked into rooms all day while mothers are out working or given into the charge of persons who condemn them, in waking hours, to lethargy. This happily is rare. Monotony in infancy constitutes a denial of the conditions that make humanity possible. If one wishes to learn what infancy owes to civilization, one has but to remember the poor lad, known to history as the "Savage of Aveyron," dependent for stimuli almost from babyhood on the changes of the weather, unable to develop as a human being even the basal senses of touch, taste, and smell, or to establish those associations by means of which the mechanism of emotional expression or relief is evolved. Neither snuff nor sorrow could make him shed tears. Yet he was not a congenital idiot, or even a defective, but a human being, arrested on the threshold of childhood. It is a thrilling chapter in psychology, which tells how, through the application of powerful stimulants to the skin, the lowlier senses of touch, taste, and smell were refined and developed in him, and how this development had not only a specific but a general effect on the whole nervous system, lifting the unfortunate lad forward, as it were, into a new life! It is a little strange, is it not, that educationists have not even yet realized the meaning of these very suggestive facts. We have no savages of Aveyron in our schools to-day. Creatures arrested in their human development are not captured in our woods. Yet in every one of our great cities, and in rural areas as well, we have tens of thousands of children whose condition does in some respects (though with great modifications) resemble that of the boy of Aveyron, and who, living in the midst of a high civilization, are allowed to share only a very small part of its riches and blessings. The development of even the lowliest senses is so inadequate for tens of thousands that the attainment of normal mentality is jeopardized. Let me give illustration from experience:

The system of medical inspection of school children had not been many weeks in operation in England when it became clear that mere records and statistics, valuable and necessary in themselves, had no immediate value, save in so far as they might lead people to look for a remedy. School clinics, or, as I prefer to call them, health centers, were opened at Bradford, at Bow, and later at Deptford, a crowded district in London, and, as a result of these and their work, in other places. In these centers a dentist, doctors, and nurses are engaged. In the Deptford health center there is, indeed, a large staff of 14 persons. The aim is to differentiate the work once and for all from that of the hospital and to identify it with that of the good home and the school.

During the past year a few experiments were made in the camp, with a view to learning the actual condition of the children.


I. School-boys employed weekly.
20 hrs a week or less
20-30 hrs
Over 30 hrs.
Fatigue
50%
81%
83%
All London School-boys
Anaemia
25%
34%
47%
45%
Severe Nerve Signs
24%
25%
48%
50%
Deformities
8%
18%
21%
22%
Heart Signs


II. Excluding boys working 8 hours on one day
20 hrs a week or less
20-30 hrs weekly
over 30 hrs
Fatigue
27%
82%
86%
Anaemia
24%
32%
41%
Nerve Signs
19%
45%
64%
Deformities
11%
18%
23%
Heart Signs
5%
8%
18%

It was realized that the development of the oldest senses must have a great effect on the mentality; so one of the first experiments was concerned with them.

On various occasions the eyes of the children (who, be it said, enjoyed the experiment) were bandaged. Various flowers of pungent smell or sweet perfume were given to them. (They came from their own gardens and were familiar to them by sight.) Only one or two children could recognize any flower by smell. It was strange to see a large class sit wonderingly sniffing at the flowers and puzzled to know what this kind of sense impression might be that they were expected to enjoy.

Together with this indifference to scents and smells, there was a rough dry condition of the skin and also great insensibility to heat and cold. It is true that many of the children, swathed in many garments, were afraid of cold: but tests with cold, tepid, hot water showed in nearly every case an amazing insensibility and powerlessness to discern or appreciate differences of temperature. That the defect was not in the sense organs, but in the brain centers not yet educated to discern vast ranges of stimuli, is evident from the fact that all were capable of receiving training.[1]

The effect of monotonous occupation in the years before adolescence is very strikingly illustrated through an inquiry made seven years ago by Dr. Thomas, a medical officer of the education committee of the London County Council. Dr. Thomas took several thousands of London children of normal capacity and health from 14 or 15 representative London schools. From the same class of children he examined an equal number who were earning money as newsboys, bakers, and carrier boys, milk boys, nurse girls, messenger boys, and barbers' assistants—all under the age of 14.

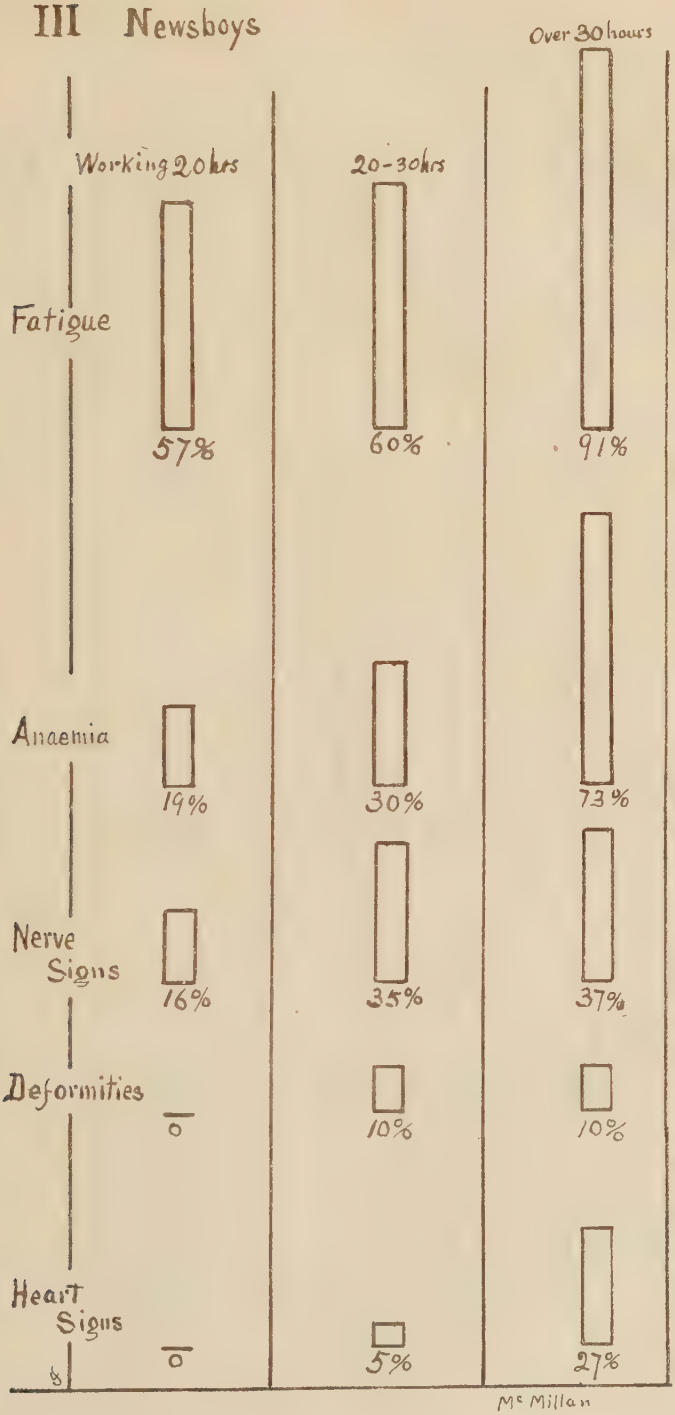
The effect of the work was not in every way bad for every order of child worker, but the general effect can not be described as anything but disastrous. For example: It is to be presumed that the newsboys did not suffer in every way, for the percentage of anemic lads among them was lower than among school children. On the other hand, the newsboys showed many symptoms of nervous disturbance, coming out worse than any other group in the column headed "Nerve signs." There was also a rise in the number said to be suffering from "heart disturbance." The inference is that the open-air life had helped them physically but not enough to overcome the evil effects of strain and effort during many hours every day.

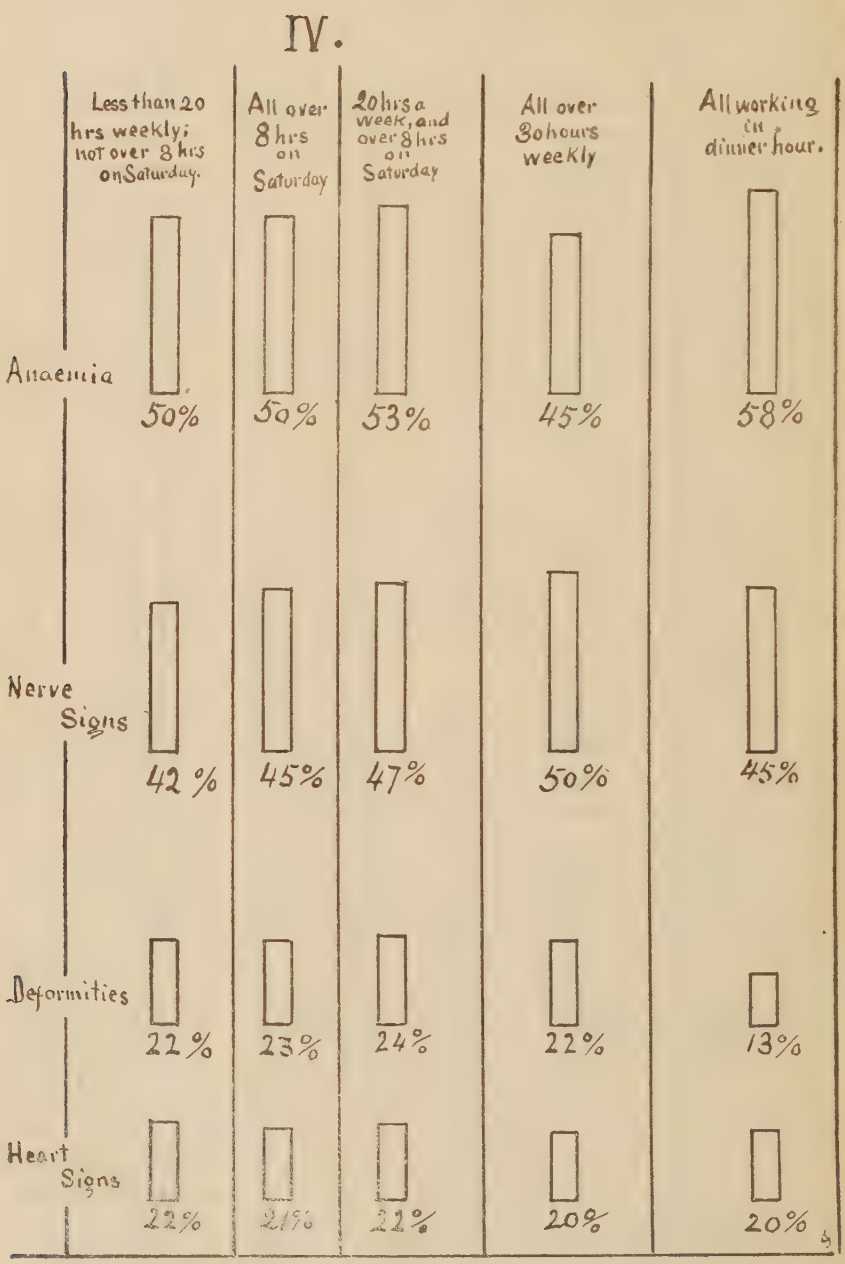
More startling was the evidence given as to the effects of carrying weights in the years below adolescence. The number of nonwage-earning children found to be suffering from deformity, incipient or developed, was 8 per cent. The percentage rose for bakers and carrier boys from 20 to 25 per cent, according to the number of hours of

labor. The bakers' boys did not carry weights. They naturally carried the basket, however always on the right, or, in some cases, on the left arm. The result was a falling on that side so noticeable that the doctor on entering any school room can easily pick out all the bakers' boys. Anyone who understands what the ulterior effects of this deformity may be will regard it as serious.

The milk boys (who suffer from lack of sleep) stood very badly after a few weeks, showing a sudden rise of from 8 per cent to 20 per cent of deformity cases. Whereas only 24 per cent of the nonwage earners showed acute nerve symptoms, 28 to 50 per cent (according to the hours worked) of the wage earners had acute nerve symptoms.[2] The girl nurseses suffered from lateral curvature. The barbers' boys were the most unfortunate of all. Seventy per cent had serious signs of heart disease or anemia after a few weeks' work. This occupation is described as fatal for children. Setting aside for our purpose here the enormous amount of disease and defect caused by the employment of children we have to emphasize only the fact that monotony, even in the mode of using the large arm muscles and without any heavy physical strain, induces deformity. The inference is that the muscular and nervous system of a child of 14 years old is not adapted for specialized muscular labor or for muscular strain of any kind. The swift and dreadful effects of the barbers' shop work are to be attributed to various causes, of which foul air and strain (owing to long hours) are among the chief.

There is another aspect of the question which is very rarely touched on—to wit, the mental aspect—the effect of child labor, not only on the spinal and muscular system, but on the whole brain. A boy or girl in the years before adolescence has to learn the gymnastics not only of working, but of thinking. All the more obvious kinds of muscle activity, implied in what we call work, play, etc., lead on to that form of activity of whose processes we know nothing save that thought and will act on the muscles and by the muscles. That thought is quite literally a muscular thing, evidence of the most various kind is at hand to prove. To keep to the results of the experiment cited of 330 wage-earning boys Dr. Thomas found 86 who were one standard behind their age; 83 were two standards in the rear; 37 were three standards behind boys of their age, and 3 were four standards behind. It may be suggested that these children were of an inferior type, mentally and physically, but on the contrary a large percentage of them were above the average, not below it, before going to work. It would seem that only a very small number could be described as in any way below normal, while 17 per cent were found to be exceptionally bright. They were at the top of the school. Some had been marking time for a year. "These results show," said Dr. Thomas, "that child labor out of school hours is a wanton dissipation of


III Newsboys
Working 20 hrs
20-30 hrs
Over 30 hours
Fatigue
57%
60%
91%
Anaemia
19%
30%
73%
Nerve Signs
16%
35%
37%
Deformities
0
10%
10%
Heart Signs
0
5%
27%
Mc Millan


IV.
Less than 20 hrs weekly; not over 8 hrs on Saturday.
All over 8 hrs on Saturday
20 hrs a week, and over 8 hrs on Saturday
All over 30 hours weekly
All working in dinner hour.
Anaemia
50%
50%
53%
45%
58%
Nerve Signs
42 %
45%
47%
50%
45%
Deformities
22 %
23%
24%
22%
13%
Heart Signs
22%
21%
22%
20%
20%

children's powers and that the evil effects of it fall on the best children." The amount of work determined the amount of deterioration in a striking way. Of the boys working 20 hours per week, 15 per cent showed serious heart symptoms. Of those working 30 hours per week, 20 per cent had severe heart signs. Acute nervous symptoms were present in 50 per cent of boys working 30 hours.[2]

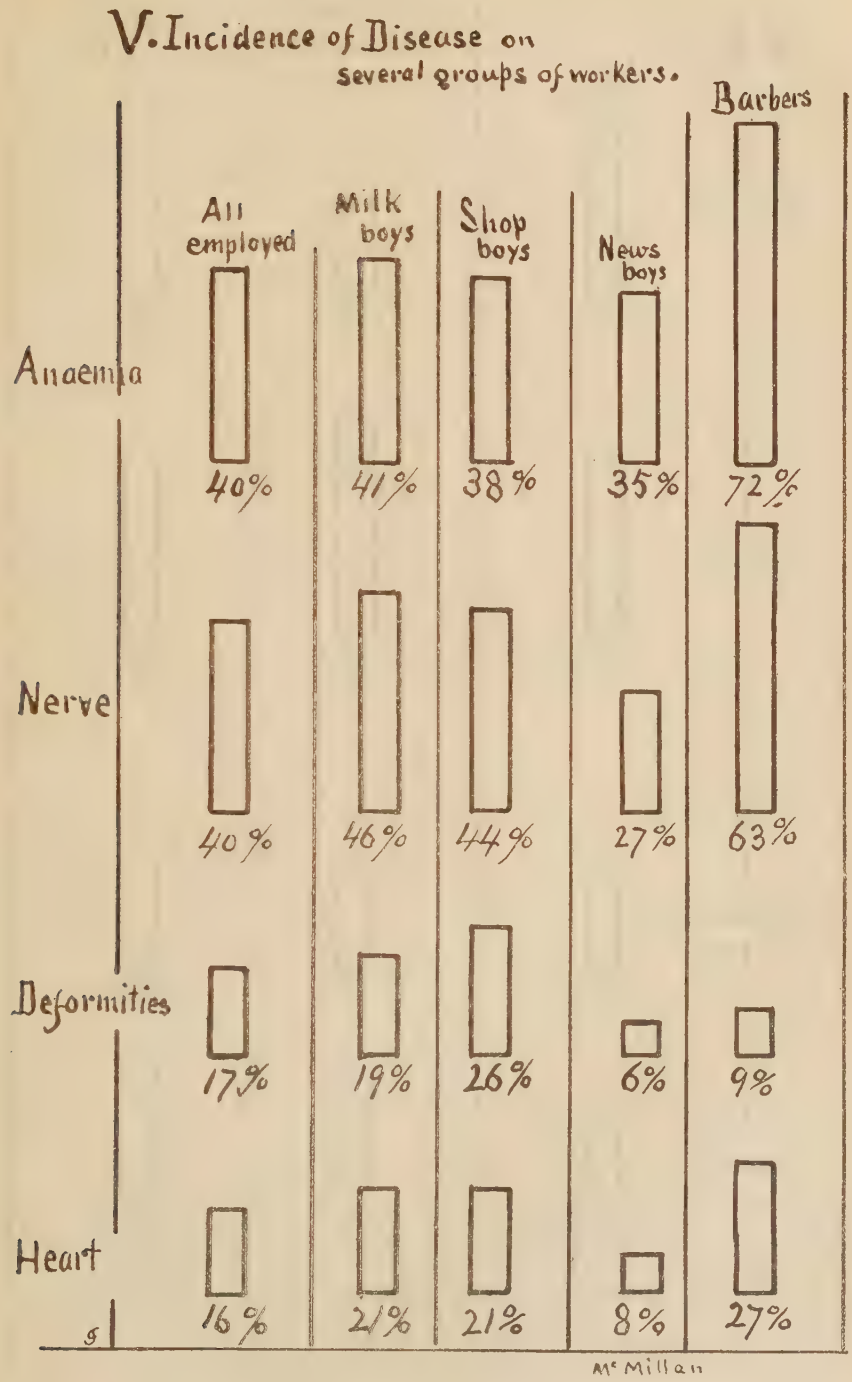
Happily, America has not gone in for the half-time system. It was one of Britain's blunders. But even to-day America allows the children of some States to labor during longer hours than even the half-timer has to put in. It is worth while to cite here at least one order of evidence showing how these must suffer in mental development, and how we can no longer think of mind and muscles as things that have no association. Mosso measured the hand grips of laborers, of clerks, and of trained physiologists. The laborer, in spite of his great weight, registered a low figure on the dynamometer. The scientist's fingers, reenforced by the cumulative power of a trained nervous system, showed an energy greater than the clerk's, and vastly greater than that of the laborer. And here we are at the crux of the whole matter. Behind the lower level cortex, and screened by it, there are great silent areas of the brain whose processes are hidden, but whose activity, so far from being divorced from the muscular system, acts on the muscles and by the muscles. Physical education begins in crawling and in grasping things. It is carried on by all activities and training, by work and play, by reading and drawing, and getting control of the larger, first, and then the smaller, or fine, muscles. But beyond that there is a gymnastic of thought and will, of voluntary attention and inhibition, that leads on to higher conquests, and this has to be practiced in the years before adolescence.

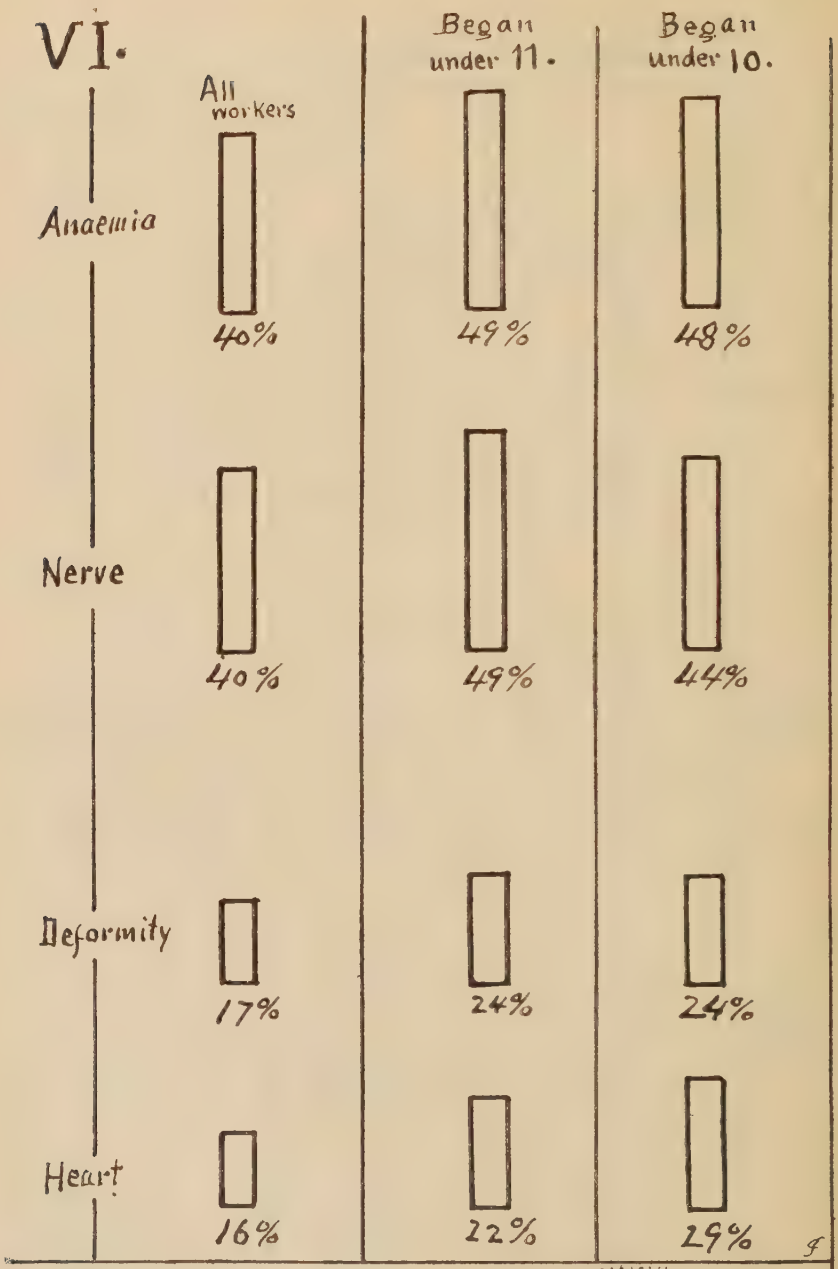
Again let me refer to observations made in the health centers at Deptford. After the operation for the removal of adenoids all the patients go to the teacher of remedial drill, so as to acquire new breathing habits, and to have the organs concerned in speech overhauled, as it were, and put in order. Most of the exercises are in a sense mechanical—as mechanical as the massage of stiffened lips, or the exercise of the long inert muscles of a typical " adenoid " face. But if one examines the various movements involved in the remedial drill one is struck by the fact that they are the movements of voluntary attention and interest. The diaphragmatic breathing, the closed glottis, the tightened lips, the slowly dilated nostrils, the steady eyes and front have to be acquired by practice and efforts. These movements are right ways, we say, of using organs. But they are more. They are integral parts (not mere accompaniments) of thinking itself. To acquire them is to acquire, in some degree, the power of thought itself. We may not only try to induce them; we hail their advent as the beginning of real mental awakening. Attention, how-

ever, is developed through them. Attention is an exceptional state, we know, because it is accompanied by the movements that imply stress and strain. That it is the birthright of every well-endowed human being to develop his attention-power we know, because we can not finally cure a disease, such as adenoids, without making the cured child once more a thinker. (The obstruction induces the state known as aprosexia, in which a child loses nearly all power of concentration.) As a matter of hygiene, then, higher education may be said to be necessary. The health is jeopardized when the mentality is arrested. The trained thinker lives long. The high mortality of the illiterate, and also the character of the diseases from which they die, shows that ignorance means literally death. (The death rate among unskilled town laborers is high. In the country many unskilled workers die of softening of the brain.) Life is a collection of functions that resist death, and the unlocking of the energy of every new nerve cell increases the power of resistance.

The effect of higher education can perhaps be best illustrated in the life of those to whom it is denied. In Yorkshire and Lancashire, where the half-time system is still in vogue, children may, even in the twentieth century, enter the mills at 12, and become full-timers at 13. It goes without saying that many of these children are bright and promising. They come from a race of hill-country people, who were once the tallest and finest men and women in Britain (though, alas, this fine physique has been lost in the factories). The children got through their "standards" fast, it is evident. Most of them, though not all, had to pass a certain standard, which is high for their age, on going to work. From the moment almost that they enter the mill certain well-defined changes take place in them. Their work as doffers, tenters, and weavers is restricted in character. They grow up into young manhood and womanhood and believe, perhaps, that they have suffered no loss. On quitting the mill in the evening many of them give expression to their relief in loud laughter and in horseplay. This, as a school doctor has remarked, is a symptom. The circulation of the blood, active all day in one prescribed area, now suddenly flushes neglected areas. The tension is removed. The mill girl shouts for the same reason that the writer or student gets up and walks about his study; only, in one case, we call a natural impulse "coarseness," and in the other, we give it no hard name.

Within the compass of Britain's small area, and by what one writer would call "the artistry of chance," another working-class community supplies an illustration of what happens when circumstances favor, not arrest, but development. The inhabitants of the Shetlands, the Orkneys, and the Hebrides, living isolated lives amid the wild northern seas, can not be regarded as originally of a higher


V. Incidence of Disease on several groups of workers.
All employed
Milk boys
Shop boys
News boys
Barbers
Anaemia
40%
41%
38%
35%
72%
Nerve
40%
46%
44%
27%
63%
Deformities
17%
19%
26%
6%
9%
Heart
16%
21%
21%
8%
27%
McMillan



Workers of various conditions in relation to age of commencing employment.

race than the mainlanders. Perhaps their ancestors were less enterprising, on the whole, than their fellow Britishers. In any case, here they remain like limpets, clinging to the rocks, half forgotten or seldom remembered and farther away, for practical purposes, from the motherland than are the dwellers in Tennessee or California. When Queen Victoria died, New Zealand had the news cabled, but many Hebrideans did not hear of it for nine days. Yet here, where modern industry has hardly yet planted her foot, and where people have never seen a tree or a railway train, you must look for Britain's richest crop of students in the higher fields of learning.

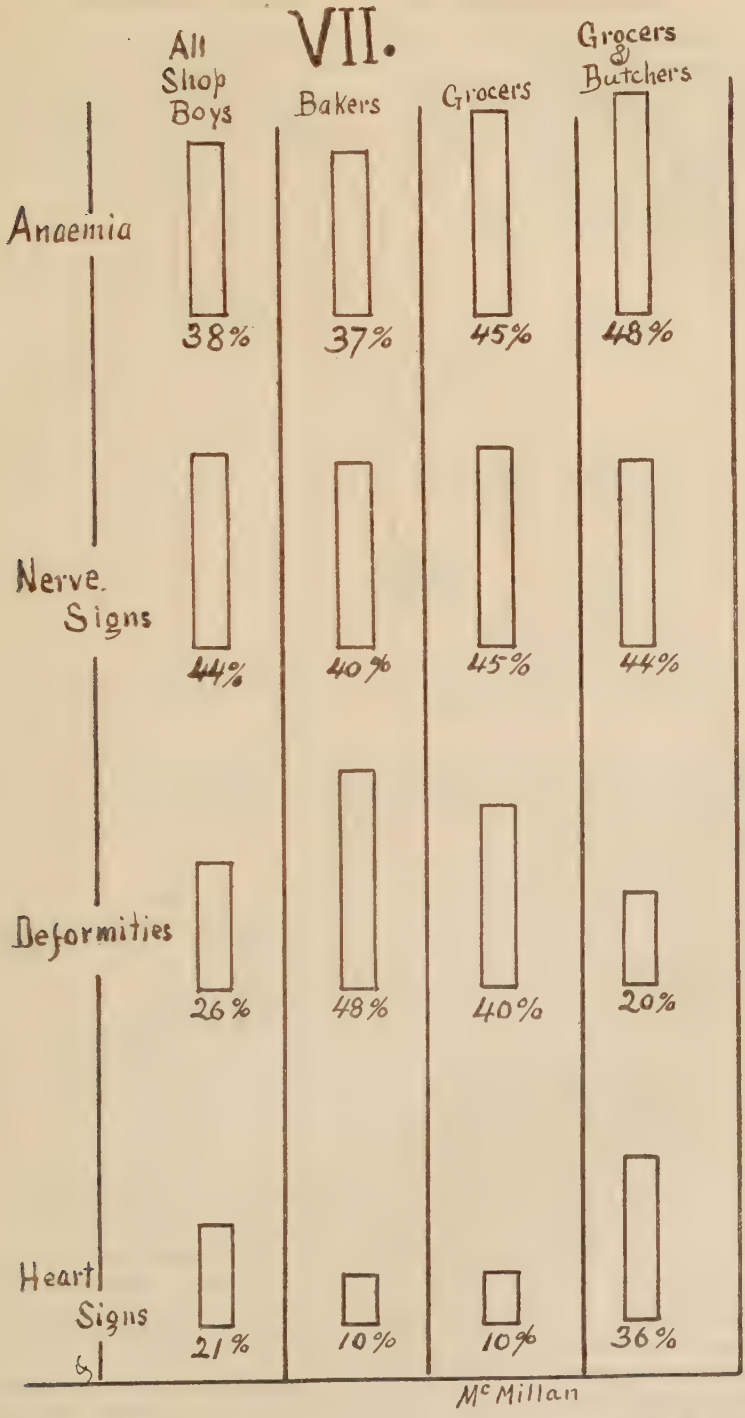
Some years ago the governors of the trust for education in the Highlands and islands of Scotland offered about 60 bursaries to be competed for annually by the children in public or State-aided schools. These boys and girls are examined in Greek, Latin, English, German, French, and science. If they were living in any of the great industrial centers, there is no doubt that the charge of overpressure would be brought against the examiners. Sir James Crichton Brown, to whom British children owe so much, has shown how overpressure does exist to-day and, above all, existed yesterday in our schools. The burden may have been light, but it was too heavy for the fatigued children of the capital. But the children of the isles are not weary. Their life is full of movement, of variety. They go out in the boats; they climb the rocks; they are active in the peat moss and on the shore; they help to build their own rude houses; they see the arrival and departure of birds all the year round; and in their homes they listen to the story of their ancestors, told in vivid, graphic words. That movement among memories which we call imagination is stimulated much and often. What is the result? "They got through the arithmetic book," said one Highland mother, "but its just a bairn's book. Too easy." "It's a pity that, at school, they can't go farther in Euclid," said another mother, "they're just playing." The results of examinations held in 1907 and the following years, and commented on, when published, by Mr. Dey, of Aberdeen, the chief examiner, are so remarkable as to challenge attention. The islands of the west and north of Scotland, sparsely inhabited as they are, yield, in proportion to their population, five times as many bursars and students of university standing as any district or area of the mainland. That is to say, that the capitals can not compete with the isles. Like a flight of strong birds, flashing above a struggling modern greyhound steamer, these win home to the goal. And where does this power of sustained attention come from, and this interest in the higher aspects of life and mentality? It is reasonable to believe that its comes from within; that it is part of the garnered treasure of the race; that the islanders have realized it; that the mainlanders are in danger of losing it (for some

reason or another); that they, too, might realize it, for it is theirs. But modern industrial methods, so costly, are depriving them, somehow, of their best heritage.

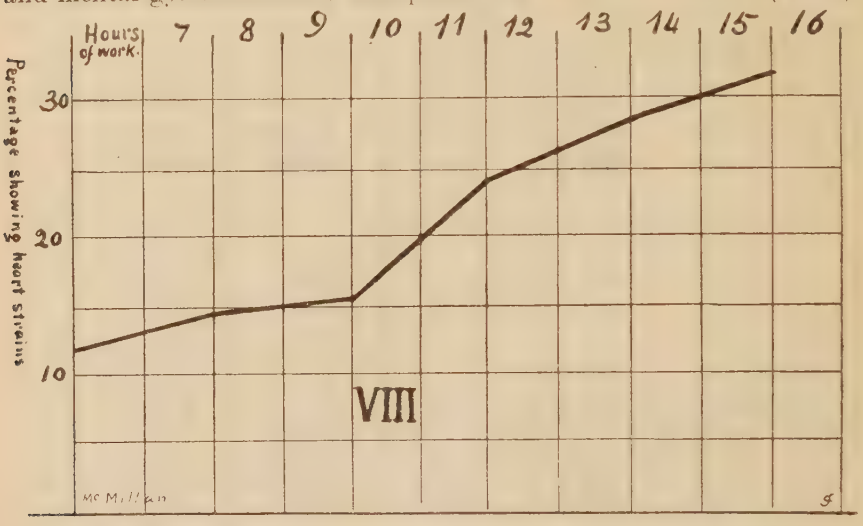
For the factory child, the newspaper and milk boy, the wage-earning children who leave our schools in tens of thousands every year, do not long to enter the universities. They can not be induced to go to even a recreative evening class, save in the proportion of one out of three. The effect of monotonous toil before adolescence is not to be looked for in our medical statistics alone. It is to be traced in the habits and desires and amusements and tastes of a people. The trend of those who have to labor early in mills, workshops, or in other centers of industry appears to be toward the winning of passive forms of sensory stimuli. The disinclination for any but the simplest forms of muscular or voluntary exertion surely indicates a certain torpor of the higher brain centers, whose activity is the crown of a nation's, as of an individual's strivings.

What is the position of an adolescent and of a boy or girl on the verge of this period to-day? In some respects the century in which he is born is an unfortunate one. Industry is becoming more and more differentiated, and with this differentiation comes the need of vast armies of lowly specialists, of workers who have not simply to learn what drudgery means, but who can hardly learn anything more. This is as true in the laboratory as in the factory. The laborers who obey orders and execute monotonous tasks are not following, but only serving.[3] Meantime the brighter children of the working class are ready to leave school before adolescence and what is even more grievous, they are marking time in many instances during the last year of primary-school life. For various reasons the home can not offer either the sensory experience or the higher order of training in the years before and during adolescence that would arm the young man or woman to meet such conditions as await him. The task of the school is, of course, a more or less restricted one. But, owing to the nature of modern industrial conditions, it is gaining a new significance and growing importance. The school is becoming more and more a way of escape, a door of hope, the only one for many. Its success would appear to depend on the ability to offer, in the first place, a certain amount of nurture (as distinct from mere treatment of a detail character, such as the care of teeth, eyes, ears, etc., though including all these) and, secondly, on its power to offer a fine and continuous training or drill that will insure the awakening and development of the higher brain centers and carry the young citizens beyond the risk of deterioration through monotonous toil in adult life. But above all it depends on the provision of or stimulating environment for the young—a restoration to open-air life by night and by day.

Our notions on the scope and possibilities of physical culture may be indefinitely enlarged. Ling has not spoken the last word on it.


VII.
All Shop Boys
Bakers
Grocers
Grocers & Butchers
Anaemia
38%
37%
45%
48%
Nerve Signs
44%
40%
45%
44%
Deformities
26%
48%
40%
20%
Heart Signs
21%
10%
10%
36%
McMillan

In Paris, Roguet, the pupil of Binet, is showing how feeble wits may be strengthened; how the lethargy of the perceptive powers, the imagination the memory, can be broken up by a form of drill that admits of indefinite variety and expansion. Mental gymnasia are the corollary of (so-called) physical gymnasia. Once the health center and mental gymnasium are incorporated in the public-school system,



Increase of heart strain with increase of labor. Rapid increase when work exceeds 9 hours.

and the age raised to 16, the young generation may be practically shielded against the deteriorating effects of industrial life. To equip these and to develop them may, we hope, be a part of the mission and triumphs of America.

---

[1] As this dullness appears to be a very serious matter, inasmuch as te higher brain centers are certainly dependent on the richness of a lowlier life and are fed by it as the rivers are fed by the rains and the springs, it may be permissible to say a word or two as to the means taken to remove it.

The night camp is in the midne of the slum region, but the air is nevertheless wonderfully pure, especially at night. It is furnished with hot and cold baths. The garden is full of plants. The sleeping shed is open entirely on one side and partly open on two of the other three. Baths, massage, exposure to open air and sunlight, and the training of the attention in all that concerns the basal senses are ncluded in the educational method. The means are also an occasion for training in taste. The mothers come to see their children go to bed. In this way they share directly in the educational work, and the neigbors, looking out of their windows, begin to understand very soon the new ways of liivng.

[2] Of all school children, working and nonworking, 25 per cent have anemia, 8 per cent are deformed, 8 per cent show severe heart signs, 24 per cent show severe nerve signs. Of the wage-earning (20 to 30 hours per week), 47 per cent are anemic, 44 per cent had severe nerve signs, 21 per cent are deformed, 15 to 20 per cent show severe heart signs. The children working over 30 hours a wek are in a worse condition.

[3] The writer was informed by Prof. Turner, professor of astronomy at Oxford, that even in the laboratory of the scientist the young men engaged have to be content to do drudgery with little hope of joining the few who do research work.

CHILD LABOR IN THE UNITED STATES.

OWEN R. LOVEJOY, General Secretary National Child Labor Committee.

The present address must be a plea for the development of scientific study of the physical effects of child labor in America, rather than an exposé of the results of such research. For, as a matter of fact, no such study has been made, and we are still in the position of those who fight an enemy of the human race without waiting to learn by experience the extent of its virulence. This is said not as an apology, but by way of explanation.

When the National Child Labor Committee was organized eight years ago, there were no accepted standards of protection against child exploitation. Boys of 10 years were common in the blinding dust of coal breakers, picking slate with torn and bleeding fingers, or sweltering all night in the glare of the white-hot furnace of the glasshouse; the incarceration of little 10-year-old girls in the dust-laden cotton mills of the South; or the silk mills of Pennsylvania for 12 hours a day was looked upon with approval or indifference; tobacco and cigarette factories, canneries, sweatshops, the street trades, and the night messenger service all took unchallenged toll from schoolhouse, playground, or cradle, and, despite the evidence gathered from England, Germany, and other European countries attesting the waste and folly of the system, child labor was almost without an enemy in America.

The initial duty in the premises we conceived to be to organize a campaign of opposition to such forms of the abuse as ought to be obvious to any person of intelligence. We believed, for instance, that no scientific data are required to prove that the employment of a 10-year-old girl for 12 hours a night in a Southern cotton mill or a 10-year-old boy for 9 hours a day in a Pennsylvania coal breaker is injurious to the health of the child. It seemed wholly gratuitous to suggest that detailed comparisons should be made of the physical development of such children with those not thus employed in order to prove that such labor of children should be forbidden.

We undertook to direct such activities as would immediately combat the more inhuman forms of the system and attempted at the same time to awaken and stimulate an attitude of scientific statesmanship among those qualified by medical and hygienic training to discern facts not patent to the layman.

A brief summary of the results of this somewhat militant campaign brings out the fact that during the past eight years the age limit for employment of children has been standardized, and no state can look upon itself as enlightened which permits employment of normal children under 14 years of age in manufacturing or mercantile establishments. In occupations known to be hazardous or dangerous to

health the minimum has been fixed at 16 or 18 years; working hours have been reduced in 10 states to 8 per day and 48 per week; night work for children under 16 has been forbidden, and other safeguards have been thrown around minors who are allowed to continue in employment.

The chronological age test for children seeking employment, which was general eight years ago, has been supplemented in many states by requiring sufficient physical examination to at least discover whether the child corresponds to the norm for its age, and the public now generally recognizes that educational and physical tests are essential to any adequate dealing with the problem of committing children to industry. Suggested methods of testing the physiological age of the child have been contributed by various specialists, among whom in this country perhaps the most prominent are Dr. Thomas Morgan Rotch, of the Harvard Medical College, and Dr. C. Ward Crampton, of the New York public school system. The one suggests the Roentgen ray to test the bones of the wrist and the other advocates reliance on certain more superficial evidences of puberty. Unfortunately the profession is thus far so widely at variance on either the feasibility or the accuracy of such tests that they can serve no practical purpose for the untrained layman. Meantime we have relied upon the general principle of advocating the maximum standard of protection, and combining the age record with such physical tests as can be made in school or health offices.

In an address before the fourth annual meeting of the National Child Labor Committee, Prof. Charles R. Henderson, of the University of Chicago, said:

> We already have ample medical information for a fair judgment of the effects of premature factory labor, and the experience of older countries has value for us.
>
> It is certain that exhaustion by fatigue is to be charged with a very great number of occupational accidents. Children and youth placed in positions which require maturity of muscles, nerves, and judgment are necessarily heedless and awkward. They endanger themselves and others, especially when they are weary. The records of accidents by age and by hour of the day are significant in this connection.
>
> Premature child labor in mine, mill, and factory increases exposure to some occupational diseases. Certain poisons, dust, vapors, and germs may be resisted or tolerated by vigorous men which are fatal to young persons and women.

And at our seventh annual conference, Dr. Henry Baird Favill, of Chicago, said:

> As a practical proposition, nobody can question that the effect of long hours, rigid duties, sustained effort, and more or less bad hygienic conditions which prevail of necessity in industrial pursuits, are damaging to the physical welfare of the individual child. If damaging to the physical welfare, there is equally no question that it is limiting to the mental development and perversive of the moral development to a greater or less extent. Let us grant, for the sake of extreme fairness, that teaching a child dexterity, industry, and responsibility

has a value. Can any honest mind doubt that these alleged advantages are more than offset by teaching it the dexterity of an automaton, the industry of a driven slave, and the responsibility of a premature burden bearer?

But as lines are more closely drawn, the need for scientific research and an accumulation of expert evidence become more apparent. There are sections of the country where it is still possible to employ children of 10 or 12 years for excessive hours and under conditions considered unsanitary even for adults. And these conditions continue without the violation of law and with the approval of public opinion. The valid principle that employment is better for children than idleness is frequently made the basis for systems of child-wage slavery which disgrace our civilization.

In every legislative campaign we enter, the claim is advanced by those who oppose reform, that conditions are not injurious. Cotton manufacturers defend the employment of little children by picturing the cotton mill as a health resort, and drawing lurid pictures of the disease-laden farms from which the industry has rescued the helpless child. Glass manufacturers contend that boys are better off at work all night than during the day, because it is cooler at night and because the boys themselves like it better. The great fruit and vegetable canning industry pictures its rush season as an annual picnic for the thousands of mothers and children who luxuriate in a labor week of 75 to 90 hours in sweltering or storm-swept cannery sheds. The exploitation of little children by commercialized industry within their own tenement rooms has been almost wholly unchecked, because of the popular tradition that the parents own the children, and that "a man's home is his castle."

Evidently, more conclusive facts are needed by wise scientific research to complete the emancipation of working children. And we welcome the opportunity afforded by this great congress of scientists to submit the following concrete suggestions in cooperation, all of which have been urged at conferences of the National Child Labor Committee, but none of which have been put into full practice:

I. We first urge compulsory registration of births in all states, and the requirement of a birth certificate when a child wishes to work in a factory. This requirement is of importance from many points of view. We shall never establish sound principles of public health in this country, nor lay the basis for accurate statistical tabulation, until we at least know the date of birth of the subjects to be tabulated. The demands of education, citizenship, property inheritance, and other considerations join with the requirements of public health in demanding this service of our commonwealths. In nearly half the country birth registration is the exception, while within the registration area ignorance or nonobservance of the law is so frequent as to vitiate many deductions drawn from attempted age tabulations. An accurate registration system would stop the perjury of many parents

and many of the evils of child labor under legal age. When, some three years ago, a law was passed in Pennsylvania, requiring documentary proof of age before work certificates could be issued, it was estimated by citizens of that State that not less than 12,000 or 15,000 children were taken from the mines, mills, and mercantile establishments and returned to school.

II. Let the health experts in each state demand of their state government a complete record of industrial accidents and diseases, recording the age of each person injured, so that we may know authoritatively what relation child labor bears to hazardous industries.

Information has been gathered from various states to supplement expert evidence upon which we have based a legislative program to exclude children under 16 years from any of the following occupations:

(1) Adjusting any belt to any machinery; (2) sewing or lacing machine belts in any workshop or factory; (3) oiling, wiping, or cleaning machinery or assisting therein; (4) operating or assisting in operating any of the following machines: (*a*) Circular or band saws, (*b*) wood shapers, (*c*) wood jointers, (*d*) planers, (*e*) sandpaper or wood-polishing machinery, (*f*) wood-turning or boring machinery, (*g*) picker machines or machines used in picking wool, cotton, hair, or any other material, (*h*) carding machines, (*i*) paper-lace machines, (*j*) leather-burnishing machines, (*k*) job or cylinder printing presses operated by power other than foot power, (*l*) boring or drill presses, (*m*) stamping machines used in sheet metal and tinware or in paper and leather manufacturing, or in washer and nut factories, (*n*) metal or papercutting machines, (*o*) corner-staying machines in paper-box factories, (*p*) corrugating rolls, such as are used in corrugated paper, roofing, or washboard factories, (*q*) steam boilers, (*r*) dough brakes or cracker machinery of any description, (*s*) wire or iron straightening or drawing machinery, (*t*) rolling-mill machinery, (*u*) power punches or shears, (*v*) washing, grinding, or mixing machinery, (*w*) calendar rolls in paper and rubber manufacturing, (*x*) laundering machinery; (5) or in proximity to any hazardous or unguarded belts, machinery, or gearing; (6) or upon any railroad, whether steam, electric, or hydraulic; (7) or upon any vessel or boat engaged in navigation or commerce within the jurisdiction of this state.

This bill also provides that—

No child under the age of 16 years shall be employed, permitted, or suffered to work in any capacity (1) in, about, or in connection with any processes in which dangerous or poisonous acids are used; (2) nor in the manufacture or packing of paints, colors, white or red lead; (3) nor in soldering; (4) nor in occupations causing dust in injurious quantities; (5) nor in the manufacture or use of dangerous or poisonous dyes; (6) nor in the manufacture or preparation of compositions with dangerous or poisonous gases; (7) nor in the manufacture or use of compositions of lye in which the quantity thereof is injurious to health; (8) nor on scaffolding; (9) nor in heavy work in the building trades; (10) nor in any tunnel or excavation; (11) nor in, about, or in connection with any mine, coal breaker, coke oven, or quarry; (12) nor in assorting, manufacturing, or packing tobacco; (13) nor in operating any automobile, motor car, or truck; (14) nor in a bowling alley; (15) nor in a pool or billiard room; (16) nor in any other occupation dangerous to the life and limb or injurious to the

health or morals of such child; (17) nor shall any child under the age of 16 years be employed upon the stage of any theater or concert hall, or in connection with any theatrical performance or other exhibition or show.

This standard of restriction was indorsed in 1911 by the National Conference of Commissioners on Uniform State Laws, and in August of the present year by the American Bar Association in general session. These suggestions have been adopted, with slight modifications in Arizona, Colorado, Connecticut, Illinois, Maryland, Minnesota, New York, Wisconsin, and a few other states. Massachusetts further provides that the State Board of Health may from time to time determine whether any particular trade, process of manufacture, or occupation, or any method of carrying it on is sufficiently dangerous to the lives, limbs, health, or morals of children under 16 to justify their exclusion therefrom, and this provision has been recently applied substantially in Arizona, Kentucky, and Oklahoma.

III. But many occupations in which children engage can not fairly be classed with what Dr. Thomas Oliver calls "the dangerous trades." They are occupations in which adults may engage for many years without apparent injury to health, and in many, the number of accidents or cases of acute illness of working children is small. None the less, the principle of health preservation requires that the more subtle evidences of all industrial injuries shall be carefully studied and recorded.

At the fifth annual conference of the National Child Labor Committee Dr. Albert H. Freiberg, of Cincinnati, in an address on "Some Effects of Improper Posture in Factory Labor," said:

> During the period between 12 and 18 years we have to deal with physical and mental changes in the individual which are of enormous importance and which are recognized by everyone to be so physiologically—a period which is fraught with great dangers to the child, dangers mental, moral, and physical; a period during which the child grows more rapidly in length than at any other time save that of early infancy. * * *
>
> There is a vast difference between the work which a child's muscles do in factory employment and the work which that child will do if he is allowed to go freely as he chooses. A child between the ages of 12 and 16 or 18 years will, if given the opportunity, play and play hard. He will play baseball, play football, and he will use his muscles most energetically. * * * Therefore we are told by many who employ children, or who would like to employ children at this age, that they are not using their muscles to any greater extent than they would use them if they were given simply that to do which they would choose to do, meaning thereby play.
>
> Muscular exercise is beneficial. Exercise is our only means of strengthening the muscles, of encouraging their development, but the building up of a muscle which is actively growing and developing must be accomplished by exercises which are not too severe, which are not too long continued, and which are of constantly varying character.
>
> Furthermore, the muscle which carries out exercises must be given frequent periods of rest, during which it may recover. It should be given an opportunity to build up again that which has been consumed by use.

What happens when a child is employed in a factory? The child is employed in a factory as a rule in one of two ways—either in a standing or in a sitting occupation. Sometimes the character of the occupation is such as to combine the evil effects of both these positions.

As in the case of the child at the loom. That which is unfortunate in factory employment as far as purely physical effects upon the muscles are concerned is the fact that a muscle must perform its functions for a long period of time without the opportunity of relaxing, without the opportunity of recovering. When a muscle has performed its function up to a certain point we experience the sensation which we speak of commonly as "fatigue." Fatigue means that there is an accumulation in the muscle of the waste products of its use which have not yet been carried away and replaced by new material. If we continue to use a muscle far beyond the point of fatigue repeatedly, there results in that muscle in the course of time, instead of further upbuilding, a degeneration, and the result of such excess fatigue is the final weakening of a muscle which, if treated properly, would, on the contrary, grow stronger continuously. The result is that we find the children who are thus unable to change their position to relieve their overtired muscles taking peculiar positions, which at first we call "bad habits." We speak of the child that has round shoulders, for example, as habitually holding himself badly. Why does he hold himself badly? Simply because his muscles are not capable of holding him in a proper position. * * *

So with the child sitting at the machine, so with the child standing at the workbench continuously for periods varying from six to eight or nine hours a day. It is the lack of opportunity to relax, the lack of opportunity for these muscles to gain within a reasonable length of time what has been used up, which causes degeneration to take place, which causes this weakened condition to take place, and by reason of this weakened condition certain postures which are abnormal and which will develop into deformity.

At a former conference of the Naional Child Labor Committee[1] I stroke to show how premature employment in standing positions tends to produce postural deformities of the feet; how sitting employment in young children tends to cause distortions of the spine and chest and to what extent the conditions thus produced are likely to interfere with future industrial efficiency, as well as future health and chances for a normal tenure of life.

Standing occupations naturally involve the feet and legs in greatest strain, and more especially the feet. In consequence we see developing during the adolescent years that condition known as weak and flat foot. * * * Later, when the child has become the father and the necessity for continuous employment is apparent, the feet only too frequently become so painful that long abstention from work is imperative, and it happens not rarely that an entire change of employment can not be avoided. Thus are lost the skill and aptitude acquired during the period of prematurity. * * * Turning now to the girl in the sitting occupation, I would attract your attention to the frequent occurrence of curvature of the spine, spoken of as "lateral curvature."

Do health experts generally agree with the position so forcefully taken by Dr. Freiberg? In any event the general public has never caught the principle, and up to the present date no serious attempt has been made in any part of this country to study the effects of premature toil in industries which demand constant standing or constant sitting. Laws have been passed in several states requiring that seats shall be provided for girls and women, and some states pro-

hibit employment of females in occupations which compel them to stand constantly. But if the birth of a child by a mother whose body has been wrecked by constant standing is a misfortune to society, is it not almost an equal misfortune for a child well born to be compelled during the period when its education and health should be most vigorously promoted to look for support to a flat-footed father, who in middle life is relegated to the industrial scrap heap?

If the position of Dr. Freiberg is sound, it is the obvious duty of every state board of health to make a careful analysis of the conditions required by every industry, measure the degree of liability to the health of employees, and lay before the public such evidence as shall lead to the exclusion from every industry which requires improper posture of every child who has not yet reached sufficient physical maturity to withstand the strain.

We urge at this point the propriety of study outlines prepared by state medical associations or by the medical departments of state universities, so that students, practicing physicians, and health officers may learn to accurately record and tabulate the physical demands upon employees in every industry. Any industry that declines to cooperate in such a study will become outlawed by this new spirit of health conservation.

IV. Our fourth suggestion calls for the development of complete hospital records to the extent of covering all industrial facts. When a child is brought to the hospital or clinic suffering from defective sight, defective hearing, malnutrition, spinal curvature, broken arch, venereal disease, or accident, the customary record throws no light whatever upon the causes leading to the child's condition. If a 16-year-old girl treated at the hospital for lateral curvature is discovered to have been employed in a given industry, and in an almost unchanging position, from her tenth or eleventh birthday, is it not conceivable that the two facts have some relation? If an 18-year-old boy with venereal disease is found to have been employed as a night messenger catering to prostitutes and degenerates from the time he left school as a truant at 10 years, may there not be something more than coincidence?

In other words, just as society has already undertaken to regulate the ventilation of work places and to restrict employment where dangerous explosives and poisonous gases are used, so society must recognize the direct relation to the worker of posture and strain, dust, heat, cold, compressed air, glare, darkness, speed, and noise. And the child not inured to the rigors of life must be safeguarded against these phenomena of industry according to the degree of hazard involved.

V. Our fifth suggestion is for the further development of our public health departments, with especial reference to the examination of children in industrial occupations. This public service has been to some extent developed in Massachusetts, and creditable work has been done by the State Board of Health. In other states but slight beginnings can be recorded. Even in Massachusetts the public seriously handicaps its agents in their study of the health of young persons in relation to occupations by requiring more work than can be done with the limited appropriation for carrying out the statute provisions. Among the subjects of investigation required of the State board of health are:

1. The prevalence of diseases dangerous to public health in home, schoolhouse, factory, or elsewhere.

2. Sanitation of schoolhouses and industrial establishments.

3. Information concerning the health of young persons in factories at their work, and the influence of such occupation upon the health of these minors.

The chief defect in the Massachusetts system is the lack of proper places for physical examination of young persons whenever, in the opinion of the State Inspectors, such examination is advisable. As pointed out by Dr. William C. Hanson, of the State Board of Health:

> This is the most serious handicap in connection with the work of the inspectors, not only because the absence of suitable places for examination of minors means inaccurate and incomplete data concerning their health, but because the absence of accurate and complete data means the impossibility of accurate statistical information to show either the percentage of minors in ill health in our factories or the percentage of minors whose health is more or less affected as the probable result of injurious influences of different occupations or processes.

Dr Hanson says:

> When conditions of ill health or of physical unfitness are discovered, aside from communicable diseases, two courses are open to the health inspectors: They may inform the child's parents, or, if to the child's advantage, his employer. Many have been aided, if not completely relieved, by the willingness of an employer at the suggestion of the health inspector to change their work, and, in some instances, by the interest of employers in paying in part for treatment of children found in their employ afflicted with a disease like tuberculosis. On the other hand, in the absence of authority to exclude from factories young persons found in ill health or physically unfit, the parents of the children take but little notice of information and advice given them.[2]

Physical examination of school children has become common in many states, and, at the eighth annual meeting of the National Child Labor Committee, Dr. George F. Ross, Superintendent of Health, Guilford County, N. C., urged the importance of extending medical inspection from schools to mills. In defending the necessity

for such examination, Dr. Ross contrasted the factory conditions with those of rural communities, and said:

> Boys in the country may spend the same number of hours at work as the factory boy, but usually a country boy's work is outside, while the mill boy works in a steam-heated building, where air is hot and moist or dust laden—a condition conducive to enlarged tonsils and adenoids, which predisposes to lung trouble and lowers his powers of resistance for other infections.
>
> Another reason for medical examination of mill children is because of night work. * * * With the long hours at a time when children, of all people, should be asleep, with their lunch at midnight, improperly prepared and hurriedly eaten, and with their broken rest the day following, these boys and girls can not get their normal development.

But the menace to health which makes this demand upon our public service is not only for the protection of the child itself, but for the protection of the community. Quoting again from Dr. Hanson, of the Massachusetts State Board of Health, at the sixth annual conference of the National Child Labor Committee:

> In the school, when such affections as pediculosis, scabies, blepharitis, trachoma, etc., are detected they are vigorously excluded until remedied. Why not in the factory? In the school each child's sight and hearing are tested annually. Why are not the sight and hearing of each young person in a factory tested annually and a judgment formed for each child based on the kind of work done and the conditions under which the work is done? Why should not children in factories receive even greater attention than those in our schools, when many factory children are exposed to influences far more inimical to health than the conditions to which school children are subjected in schoolrooms and for longer daily periods?

VI. We have frequently referred in this paper to the physical examination of school children, and their remains, as our final suggestion, a brief reference to this matter.

In the development of health standards for regulating the employment of children, we believe the public-school system should be called into requisition. The school furnishes the ready channel through which the American child may pass and be checked, classified, and tabulated with the least expenditure of time or money.

The commission to codify and revise the laws of Ohio relating to children recommends compulsory medical inspection of school children throughout the State in both urban and rural communities. This is a significant step to take, as the custom in most states which recognize the need for physical examination is to confine it to those school children who show marked abnormality, or, more commonly, to confine it to children arrested under the juvenile-court law.

At present, in a number of states, the law requires that when a child leaves school and seeks employment the school physician or local board of health shall certify to the child's physical fitness for its position. This is the highest standard thus far reached for recognizing the physical aspect of this problem. That it is superficial

and inaccurate is obvious. We have for several years urged that the states which have gone thus far ought to take the next step, and develop a real system of physical examination. It would be possible to examine every child who enters the public school, make full note of the child's physical condition and physical history up to that period, and the card describing these conditions should follow the child with the persistency of its own shadow from room to room and from grade to grade, having entries made at least annually, and special entries recording absences for illness, cases of medical or surgical treatment, development of any physical defects, records of growth by height, weight, and other tests, so that at the end of the school career the authorities would have a six or eight year record of the child's physical history. Based upon this, working certificates might reasonably be issued, when the proper time comes for the child to work. Meanwhile the records would themselves throw significant light upon many problems which to-day are confusing and are dividing our leading educators.

Manifestly this invasion of the domain of industry by the conservators of public health and education presages the rapid development of public machinery to perform so important a function. Closer relations must be maintained between our health and education authorities, in order that the metal record of the child and his physical record may not be regarded as two distinct matters, but as different phases of the same problem. The discovery that 100 children in a given school have defective vision presents a problem in education and a problem in health, but both problems relate to the same 100 children. At a conference of public-school officials we should have something to say about the better equipment of our schools, and a more comprehensive grasp of their duty to all the people, but at this Conference we need say only that in many states the public has not thus far given sufficient attention to the conservation of health to even provide agencies for that purpose. In many states, the state boards of health are without equipment or adequate financial appropriation, while many local health authorities are without either equipment or intelligence to perform their work.

The public must put an end to incompetence or self-interest in its public-health service, and we submit that medical associations, state boards of health, physicians, and experts in hygiene—those who best know the facts—must serve as pioneers in demanding that the public-health department shall be elevated to its rightful place, and be made the most important arm of city, county, or state government.

---

[1] Third annual conference, 1906. See National Child Labor Committee's pamphlet No. 43, pp. 4 and 5.

[2] See National Child Labor Committee's pamphlet No. 131, p. 3.

THE CAUSES, EVILS, AND REMEDY FOR TENEMENT-HOUSE MANUFACTURING.

Dr. ANNIE S. DANIELS, New York City.

THE CAUSES.

For the manufacturer: A problem of economy is solved; he limits his plant to such space as may be necessary to prepare the work, thereby saving the cost of maintaining a factory only, and the great obligation of obeying all the laws relating to factories and their workers. In the State of New York he is required only to keep a register of the name and address of the person to whom the work is given, to ascertain if the tenement is licensed, and to furnish a copy of this register to the State labor department. Here his responsibility ends.

For the workers: An inducement is offered to perform the work in their living rooms at all hours, day and night, Sundays and holidays, and the opportunity given to employ every available hand of 3 years old and over; to employ the aged and the sick; to give the materials to other families at other addresses, thus becoming themselves employers. Not infrequently, instead of giving out the work, they invite other workers to their rooms; they induce children to become apprentices, and, in their living rooms, create a miniature factory, more strictly a sweatshop, and subject to no law.

The articles manufactured include custom and ready made clothing for men, women, and children's wear. Literally every article of personal wear from the hat to the shoes; all kinds and grades of embroidery, including (as I have seen) church vestments and altar cloths; passementerie, buttons, flowers, feathers, hair switches, cigars, boxes of all descriptions, furs, and fur trimmings—articles allowed by the labor bureau, and some they never thought of; anything that can be carried by the worker. My knowledge of conditions in New York City is founded upon a study of those families who apply, at the New York Infirmary for Women and Children, for the free services, at their homes, of a physician, making my point of view a study of the poorest and most helpless class of tenement workers—ignorant of the language and conditions; a peasant class, still in the candlelight stage of civilization, suddenly thrust into the life of the electric light, the large majority of these families being Sicilians. No family has been included as doing tenement-house work, and no children except those whom I have actually seen at work and attended in my capacity of medical adviser.

THE EVILS.

To the manufacturer: None.

To the workers: The evils begin when they receive the goods at the loft, and continue until the article is returned as finished. From the loft, on the heads, the backs, and in the arms of men, women, and children, the heavy bundles are transported through the streets, up the tenement stairs, and later the finished product is borne back to the manufacturer. It matters not that the bundle weighs more than the child who carries it—that the woman's physical condition is such that the weight is a positive injury to her—the bundles must be carried.

During the 11 months ending September 1, 1912, I was called to attend 357 families whom I had not previously seen. Of this number, 176 families were at work on some kind of tenement-house manufacturing. In 3 of these families men at work were assisted by their wives and children; in 173 families, the workers were women and children.

Sanitary condition of the tenements of these workers.—Forty-six tenements were in moderately good sanitary condition; 124 were old, unimproved, dirty tenements; 6 were in a bad sanitary condition.

Referring to the bulletin of the labor department, which I receive monthly, 141 of these tenements were licensed; 35 were not. Of these rooms, 90 were small, overcrowded, dirty; 84 small, crowded, clean; 2 not fit to live in.

A note was made of the physical condition of these families. The general condition of one family was good; 8 were overcrowded; 162 were underfed in addition to being overcrowded.

Contagious diseases.—I was called upon to treat 79 of the 176 families for a contagious or communicable disease. Sixteen of these were scarlet fever; 9 tuberculosis; the majority were cases of measles; 1 the dreaded infantile paralysis. The usual notice of the board of health, calling attention to the disease within, was on the door, the work continuing just the same. I find that under these circumstances the work is obtained from a neighbor, at another address, and that another name is given.

The hours.—These are absolutely unregulated; usually from 5 a. m. to midnight; workers average 16 hours of actual work every day in the week, including Sundays. The Italian seems to require less sleep than the others; neither the hours nor the days of the women are shortened by her physical condition. The pregnant woman works to the hour (sometimes literally) of her delivery. I have seen a woman up and at work 10 hours after her delivery. All resume labor not later than the third day. To my inquiry why

they have no breast milk for their babies, they say: "How can I have milk? I must work." The city must supply milk stations. Death scarcely interrupts the work.

Child labor.—Some part of all the industries found in the tenements can be taught to a child of 3 years; I have seen younger toilers, but at 3 years a child's work can be counted. The girl of from 5 to 8 years is a decided addition to the working force; between her eighth year and the age at which she can be admitted to a factory she can do the work as well as her mother, especially in "finishing." The boy usually ceases to be useful as a houseworker after he is 8 years old; he can earn more money at a street trade.

The children's hours.—These vary from 5 to 12 hours in the 24. One child of 3 years worked at buttons and was called at 5 a. m., the mother pathetically stating that he did not wake easily. This child averaged six hours, during which his work was to cover a button mold with cord, his mother finishing it. In August the child died. His 5-year-old sister and his tuberculous mother still work. I have seen children only 6 years old at work at 10 p. m.

The effect of the work on the physical condition of these children.—Much is being said and written upon occupational diseases, and some attention must be paid to the physical condition of these youngest workers. At their age all parts of their bodies are constantly changing, growing, and developing; the work is performed in rooms built for living purposes, not for manufacturing. All the industries require close attention, giving rise to well-defined eye strain, always a serious condition. The constant bending over the work prevents the development of the chest wall and hinders the expansion of the lungs; the spinal column can not be maintained in the proper position. The capacity for speed becomes used up; the women tell me they must constantly urge the child to greater activity. In the case of the 3-year-old button maker, the mother stated that she could not make the child work longer than two hours at a time. This complaint of lack of speed is a common one; the child is constantly losing its power to accomplish as much in a given time. A few of the women realize that a recess from work is an absolute necessity; that play is as necessary for the mind and body of the child as food is. Indeed, the fact that a child often prefers play to food is well known. I had occasion to speak to a little 8-year-old girl of street dangers, and she answered: "I'll not be run over; I sew the pants at home." These children are being prepared to join the army of abnormal, backward children, and, later, the ranks of future unskilled workers. The children of school age are in an even worse condition than their younger relatives; they must attend school and work at home after school hours, Saturdays, and holidays.

The wages.—The worker in a tenement room can not possibly earn the amount of which she is capable; the actual amount is about one-half of what she could earn at the same work in a factory. This is due to the fact that fatigue comes more quickly; her attention is constantly distracted by the home surroundings and by the necessity of urging on the child workers. She is often obliged to take an inferior grade of work, or, if the work is of the first class, she has the added fear that it will be spoiled. This has been particularly noted among the embroiderers. A child of from 3 to 5 years earns from $1 to $2; a girl of from 8 to 10 can earn $3 to $4 per week at finishing; the average wage of the woman is rarely more than $5 per week. The majority of tenement workers obtain this work from factories. A considerable amount is brought home by those who work in stores and custom-work establishments either to earn, as they say, "a few more pennies" or to finish an order. The pay these tenement folk receive is extremely dear; the price they pay is the stunted bodies and dwarfed minds of their little children.

The evil to the public.—In the light of our present knowledge of the possibility of contracting diseases and of the part insects play in their dissemination, it is evident that there is a distinct danger in tenement-house manufacturing; the ultimate price to be paid is the maintenance of human beings who have exhausted their power of self-support before the normal period. They become old before their time and useless.

The labor bureau, in its report for 1911, states that "15,482 persons are employed in 11,510 apartments." It further states that an army of inspectors would be required to see that the law is actually enforced. The inspector visits these tenements a few moments once or twice a year.

THE REMEDY.

The factory inspector in 1888 transmitted to the New York State Legislature a report of tenement-house manufacturing, and stated: "The remedy lies in strictly prohibiting manufacturing in tenements." Since then, and during the 20 years that the State board of labor has had control, many laws have been made, but the evils continue, at times more acutely than others. The tenement conditions, as they are stated in this paper, I have personally observed for 25 years. My remedy is absolute prohibition of all manufacturing in tenement houses.

HOW AND WHY SMOKE IS INJURIOUS.

RAYMOND C. BENNER, Deparment of Industrial Research, University of Pittsburgh.

Dwellers in a district where soft coal is burned almost universally condemn smoke. Its injurious effects are well known in a general way. When, however, it comes to certain definite injuries done by smoke, and wherein it is harmful, we find that it is not a matter of common information, and, furthermore, that it has been made the subject of but comparatively few scientific studies, and those not coordinated in the different branches.

Soot is, generally speaking, the solid matter given off during the incomplete and faulty combustion of soft coal, and consists, for the greater part, of carbon, mineral matter (ash), tar, and moisture, together with smaller portions of the sulphur acids (H_2SO_4, H_2SO_3, and H_2S), nitrogen compounds, and occluded gases. This composition varies between the widest limits, depending upon many factors, such as coal, air supply, temperature of furnace, and so forth. The following analysis of soot, made by Cohen, and obtained under different conditions, shows to a certain degree the effect of some of these factors:

Fireplace.

	Original coal.	Soot 5 feet from grate (bottom).	Soot 35 feet from grate (top).
	Per cent.	*Per cent.*	*Per cent.*
Carbon	76.80	36.45	37.22
Hydrogen	4.90	3.51	3.51
Tar	.88	34.87	40.38
Ash	1.80	5.09	4.94

Boiler chimney.

	Original coal.	Bottom.	13 feet from base.	70 feet from base.	Top of 110-foot chimney.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Carbon	69.30	19.24	16.66	21.80	27.00
Hydrogen	4.89	2.71	.86	1.44	1.68
Tar	1.64	.09	.28	.80	1.14
Ash	8.48	73.37	75.04	66.04	61.80

It will be seen by comparing the analyses given that the percentages of tar and carbon are higher in the soot obtained by burning coal in a fireplace than when it is burned under the boiler. This is due, for the most part at least, to the fact that the temperature of combustion is much higher in the boiler furnace than in the grate and other domestic installations. The higher percentage of ash in the soot from the boiler furnace can be accounted for on the same grounds. It is a well

demonstrated fact that the losses due to the solid combustible matter in smoke are small, the economy accompanying the proper smokeless combustion of coal being obtained by the complete oxidation of the carbon monoxide and other invisible gases which always accompany the incomplete combustion of coal. Sir Roberts-Austin found, as a mean of some 40 experiments, that 6 per cent of the coal is lost when the coal is burned in domestic grates, while on the other hand Scheurer-Kestener found the loss to be only 0.5 to 0.75 per cent when burned under the boiler, where the temperature of combustion is higher.

Among the minor constituents of soot, the sulphur acids are by far the most important. The amount and kind formed depends upon the factors determining the composition of the soot in general. The following analysis of soot by Cohen and Herford gives an idea of the possible distribution of the sulphur:

	A.	B.
	Per cent.	*Per cent.*
Passing out as sulphur gases	71.78	60.00
Absorbed by soot	14.51	11.88
Left behind in ash	13.71	28.13

The amount of free acid in soot may be quite large, Russel having found as high as 4.9, 2.3, and 7.2 per cent free H_2SO_4, while Cohen and Ruston do not report as large amounts. They find free acid to the extent of 1.62 per cent. Arsenic is also frequently present, but only in small percentages, usually less than 0.1 per cent.

The nature and composition of soot make it the worst possible kind of dirt. It is black; in fact, it is the lampblack that forms the basis of black paints. Its power of absorption is great, giving it the property of occluding large quantities of injurious gases. The tar contained gives the soot the power of firmly adhering to anything with which it comes in contact, while the sulphur acids which it contains corrode most substances. It would be hard to imagine a more objectionable kind of dirt.

A knowledge of the chemical composition and other properties makes the injury which soot does to vegetation evident to one acquainted with plant structure and growth. Soot is detrimental to the healthy development of plants, inasmuch as it (1) blocks the stomata of the plants and stops to a greater or lesser degree the transpiration; (2) covers the leaf with an adherent black coating, which cuts down the amount of sunlight reaching the chlorophyl; and because of (3) the corrosive action of the tar, acids, and so forth. Evergreens, more especially the conifers, seem to be much more easily affected than other plants. On evergreen plants the leaves are exposed to the action of the soot for a much longer time than those

which shed their leaves at least once a year. Therefore, they become covered with a thicker coating of soot. The conifers also possess sunken stomata, which act as very effective pits to catch the soot.

One might think that the excess CO_2, which is likely to accompany the soot, would make plant growth more active, but it has been found that the increased percentage of CO_2 is not great enough to be a factor. Cohen compared laurel leaves from four different localties having different amounts of soot fall, and found the relative assimilations to be 100, 52.8, 15.2, and 11.6, respectively, and roughly proportional to the soot fall in these places. In England ash trees have been observed to shed the leaves four to six weeks earlier in the smoky districts than in districts free from smoke.

Trees automatically keep record of their yearly growth by the width of the rings. A section of a Scotch fir noted by Cohen shows the date of the erection of a smoke-producing factory near the tree by the decrease in the width of the rings. Vegetables, such as radishes and lettuce, planted in different parts of Leeds, have been found to be stunted in their growth to a degree nearly proportionate to the soot fall.

The effect of smoke on buildings and building materials is marked and it soon destroys the appearance of buildings which can not be cleaned. In smoky districts, because of the smoke, it is often necessary to modify a design in some respects. Skylights can not be used advantageously, as they soon become coated with the black soot. Drain pipes must be arranged so as to avoid the splashing of water on the walls. Building materials, such as glazed tile, which admit of easy cleaning, are used much more in smoky cities than elsewhere. Granite and sandstone with a siliceous binder form better building materials than limestone and sandstone with a calcareous binder, which is easily corroded by the acid in the soot and rain. Thus the stones which are most easily worked are undesirable in smoky cities. The sulphuric acid acts on the calcium carbonate, forming calcium sulphate, which is more readily soluble than the carbonate, also causing it to swell and become porous and friable as well as more readily disintegrated. Dr. Smith has found mortar to contain as high as 48.16 per cent $CaSO_4$, which was formed by the action of the sulphuric acid in the air, while limestone has been found to contain from 0.52 to 3.85 per cent $CaSO_4$, due to the same cause.

The effect on most metals of the sulphuric acid, occluded in soot, is rather marked and greater than the action of a like amount of acid in the rain water or air. It would seem from observations taken in Pittsburgh that the soot containing acid is made to adhere to the metals by means of its tar content, in which place it acts as the carbon. This, together with the metal and acid, forms an electrolytic couple, making corrosion much more rapid. In case of iron and aluminum the oxide and basic sulphate iron and aluminum the oxide and basic

sulphate are produced, at least in part, from the sulphate and the acid is used over and over again. To experimentally vertify these observations duplicate sets of various metals were fastened to two boards. One set was protected from the soot in the air by means of cheesecloth, yet was still exposed to the air and rain. The other set was left unprotected. The pieces of metal left unprotected from the soot show a much greater amount of corrosion than those which were protected.

I wish here to call your attention to the following figures obtained by Messrs. W. B. Worthington and A. Rattray, showing how corrosion is accelerated by the acids in the air. Quoting from Cohen: "A number of rails were placed in suitable positions by the side of the line and weighed at intervals, and the loss in weight recorded." The rails were of the ordinary railway section, weighing 86 pounds per yard. The annual loss of weight from corrosion was as follows:

	Loss in weight in pounds per yard.	Number of years of observation.
1. In the center of the town	1.04	17
2. On the seacoast among sand hills	.18	17
3. In a dry place in a smoky tunnel	1.48	13
4. In a wet place in same tunnel	1.71	8

The question of exterior and interior decoration is one affected as much by the amount of smoke in the air as by the tastes of the owners of the buildings. Interior draperies and paper are soiled much quicker in a smoky city than elsewhere. If light paper is used in papering the rooms, it must be cleaned every six months, and new paper put on at least once a year to keep it looking only half as well as it would in a smoke-free city.

The effect of soot on paint is in most cases a matter of appearance only. The time which it takes to spoil the paint depends, of course, on the amount of soot in the air, color of the paint, and tar and acid in the soot. The number of paintings necessary in a given time depends on the above factors, as well as upon the fastidiousness of the owner. In some cases the soot seems to act as a protective coating, while in others it has a corrosive action, destroying the surface gloss and rendering the surface more easily weathered.

Soot in the air of cities has a marked effect on the weather in a number of ways. By (1) cutting off the light; (2) increasing the duration of fogs; (3) making the minimum temperature higher.[1]

As is well known, finely divided carbon, in the form of lampblack, has the property of cutting off sunlight to a greater degree than most other substances. It is not surprising, then, to those of us who are acquainted with the soot clouds hanging over large cities that the duration of sunshine has been found to be decreased 17 per cent,

while if diffuse daylight is considered, the loss is even greater. Cohen finds, as an average of a large number of determinations made both in summer and winter, that fully 40 per cent of the light is cut off by the smoke cloud and that the amount of light varies inversely as the amount of soot in the air. Dr. Russel states, in his article entitled "London Smoke and Fog," that the amount of soot in the air varies greatly with the weather, and gives the following figures to bear out his statement: Fine weather, 0.0035 grams per 1,000 cubic feet air; dull weather, 0.0103 grams per 1,000 cubic feet air; foggy weather, 0.0244 grams per 1,000 cubic feet air. The amounts of CO_2, H_2S, and SO_2, together with the other gaseous products of combustion, also increase.

It may be said that each particle of moisture in a fog is formed or condenses around a solid nucleus or a dust particle. (This does not take account of ions, which are probably not of great importance in fog formation.) For this reason fogs might be thought to be of more frequent occurrence in the city than in the country. This is, however, not necessarily the case, and, as a matter of fact, dust particles for the formation of fogs are sufficiently numerous in the country as well as in the city. Smoke does, however, increase the blackness of a fog, making it much denser than the country fog, simply on account of the black soot particles. The fog is also apt to be of longer duration because of the oily tar in the soot which forms a film over the outside of the drop, thus protecting it from evaporation. It is said that at least 20 per cent of the London fogs, between September 1, 1902, and March 31, 1903, were artificially induced and preventable. The amount of soot which falls on any area during a given amount of time forms a subject of interest to the public at large as well as to the scientist. Cohen finds the air in dull weather to contain 0.0119 grams of solid matter, which he assumed to be soot, as it is always black, and these figures agree well with Russell's for dull weather. In Pittsburgh I find that the amount of soot in the air corresponds remarkably well with the figures for the English cities.

Numerous measurements of soot fall have been made in as many different ways by collecting rain and snow and by catching the dust in various forms of vessels:

Place.	Weight in tons.	Area in square miles.	Time.	Method of collecting.
Manchester	30	100	1 winter	Snow fall.
Glasgow	820	1	1 year	Boxes.
Leeds:				
Industrial	539	1	do	Snow and rain.
Residence	20	1	do	do
London	195–650	1	do	Soot gauge.
Indianapolis	600	1	do	Snow.

[1] H. H. Kimball: unpublished paper.

CHART I.

A STUDY OF THE INFLUENCE OF VARYING DENSITIES OF CITY SMOKE ON THE MORTALITY FROM PNEUMONIA AND TUBERCULOSIS.

WM. CHARLES WHITE, associate professor of medicine, University of Pittsburgh; and C. H. MARCY.

As part of the investigation into the smoke problem, which is being carried on at the University of Pittsburgh, through the generosity of Mr. R. B. Mellon, we have made a study of the influence which varying densities of smoke have on the mortality from tuberculosis and pneumonia as typifying acute and chronic pulmonary infections. Perhaps in none of the smoky cities of the world is it possible to go into the influence of smoke in the same way as in Pittsburgh. The peculiarity of the relation of high hills and valleys, in close proximity, within the city limits, makes a well-defined variation in the smoke content of the air. It will be noticed on the map (chart 1) that, along the river frontage, where for the most part the land is low-lying, the air content of smoke is very dense; skirting this dense

smoke area, the hills rise more or less abruptly to varying heights. On the lower hills, as exemplified by C, D, E, J, Y, Z, and &, there is an area of moderate smoke density. Where the hills, however, rise directly from the river to the height of 400 or 500 feet, as exemplified by R, S, T, G, K, L, N, and M, there is comparatively little smoke at any time of the year. During prosperous times, the

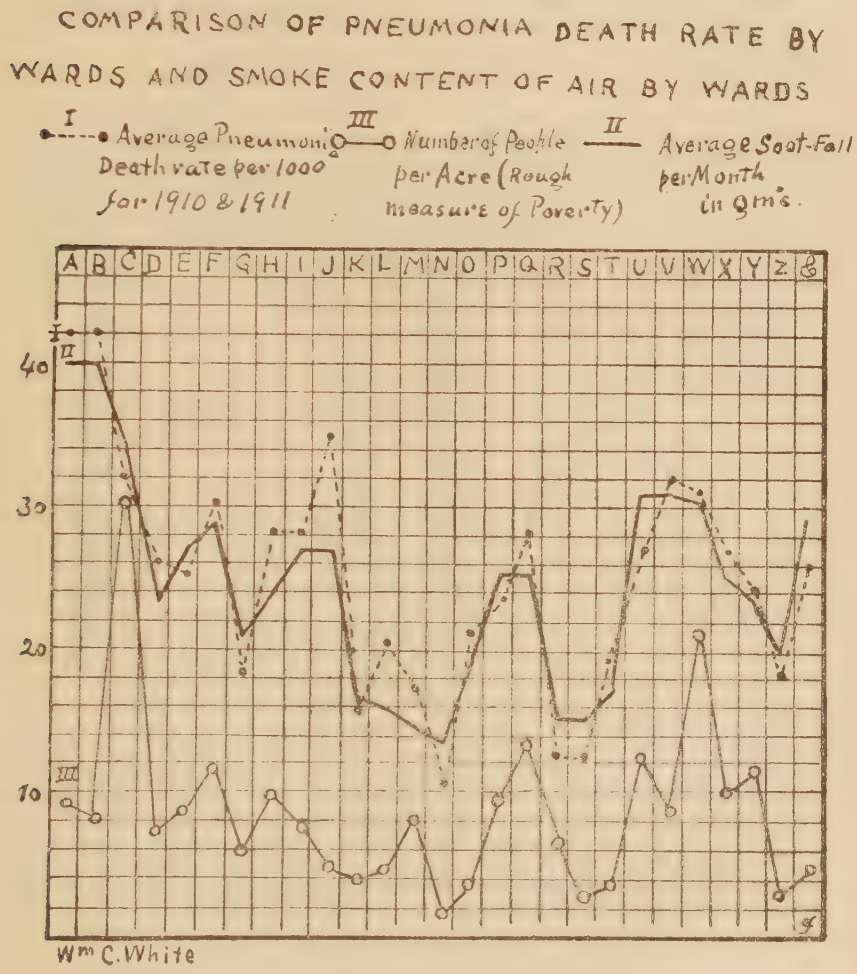

COMPARISON OF PNEUMONIA DEATH RATE BY
WARDS AND SMOKE CONTENT OF AIR BY WARDS
I
Average Pneumonia Death rate per 1000 for 1910 & 1911
III
Number of People per Acre (Rough measure of Poverty)
II
Average Soot-Fall per Month in gms.
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z &
40
30
20
10
Wm C. White

Chart II.

valley, or dense-smoke area near the rivers, is always heavily laden with smoke. This is true even when there is a brisk breeze blowing.

It is possible, from the division of the city into wards, to rule out a number of other factors, such as poverty, race congestion, and so forth, as an influencing factor in the point of relation which we have brought out by these studies.

It is unfortunate that our figures only cover a period of two years, but this is due to the fact that no records taking account of the wards of the city have been kept prior to this time and also that the number of wards was changed from 56 to 27 three years ago. This renders useless any previous comparison on the ward basis.

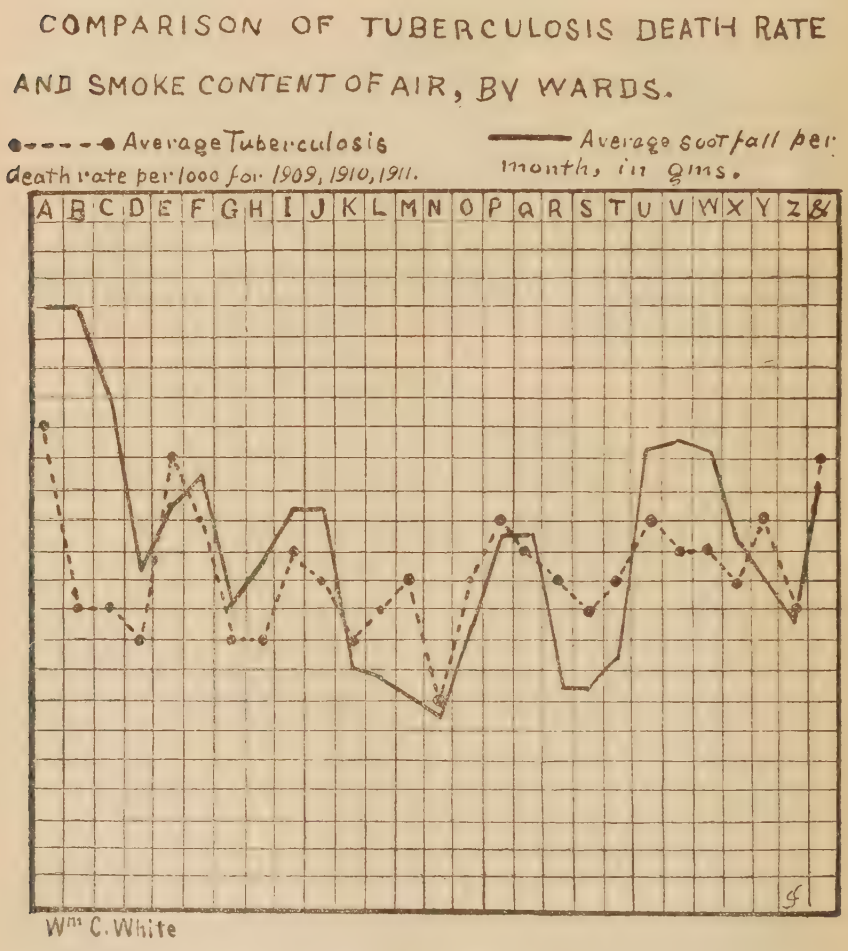

COMPARISON OF TUBERCULOSIS DEATH RATE
AND SMOKE CONTENT OF AIR, BY WARDS.
Average Tuberculosis death rate per 1000 for 1909, 1910, 1911.
Average soot fall per month, in gms.
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z &
Wm C. White

CHART III.

The figures which we have obtained are, from one aspect, very convincing, although from another aspect very confusing. It will be noticed, for instance, in Chart 4, that in Chicago, where there is a comparatively low smoke content, there is still a very high pneumonia death rate; while in Pittsburgh, with the highest smoke density, there is no higher pneumonia mortality.

The question of smoke density for the various cities has been based upon the reports of the United States Government Weather Bureau.

In the various cities which are included in this report the method of determining this density is based on the distance of vision, considering certain fixed objects in the city from an observation center. In Charts 2 and 3, of Pittsburgh, the basis has been certain carefully de-

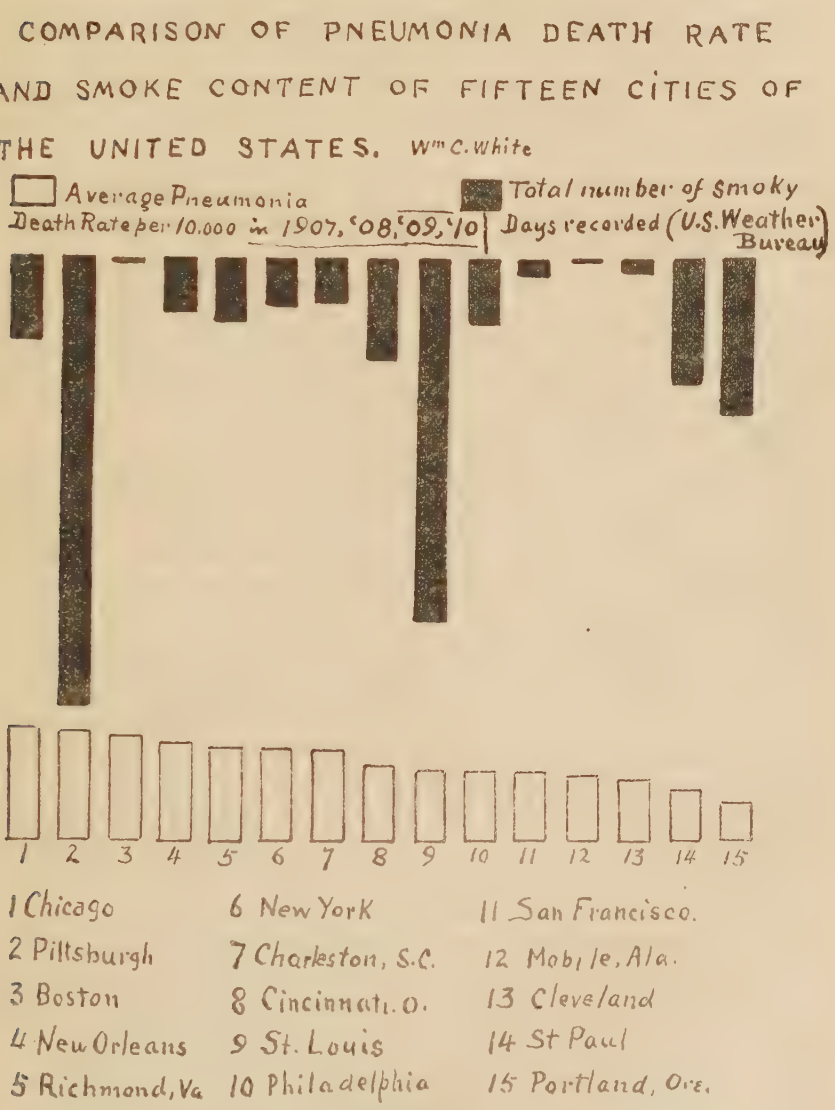

COMPARISON OF PNEUMONIA DEATH RATE
AND SMOKE CONTENT OF FIFTEEN CITIES OF
THE UNITED STATES. Wm C. White
Average Pneumonia Death Rate per 10,000 in 1907, '08, '09, '10
Total number of Smoky Days recorded (U.S. Weather Bureau)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1 Chicago
2 Pittsburgh
3 Boston
4 New Orleans
5 Richmond, Va
6 New York
7 Charleston, S.C.
8 Cincinnati, O.
9 St. Louis
10 Philadelphia
11 San Francisco.
12 Mobile, Ala.
13 Cleveland
14 St Paul
15 Portland, Ore.

CHART IV.

vised studies of precipitation of air content of carbon dust. These scientific observations have been made in connection with the present smoke study by Messrs. R. C. Benner and C. H. Marcy. In Chart 4, for the sake of comparison, we have adhered to the Government Weather Bureau report.

The mortality tables, on which Charts 2 and 3 are based, were derived from the health table of statistics of the city of Pittsburgh, and include the years 1910 and 1911.

The mortality tables for pneumonia, on which Chart 4 is based, were secured from the Bureau of Census statistics.

We desire to acknowledge here the courtesy and kindness of Director Durand, of the Government Department of Commerce and Labor, for the prompt return of the smoke studies and statistical tables from the various cities, which we scarcely could have obtained without his aid.

Since 1905, Ascher, of Königsberg, has published tables and studies on the relation of smoke to pneumonia and tuberculosis. Ascher's main conclusions are as follows:

1. The deaths from acute lung diseases are most frequent in children and old people. There is, from year to year, a steady increase in the number of these deaths. This is explained, in part, by the increased contamination of the air by smoke, because the increase in the number of deaths is greatest in districts of an industrial character and not in farming districts. Since 1875 the deaths of infants from pneumonia have increased 600 per cent.

2. There is a noticeable difference in the deaths, of acute lung diseases, in those industrial districts where smoke contamination is greater than in those industrial districts where the smoke contamination is less. The number of deaths in coal workers from acute lung diseases is 130 per cent higher than the number of deaths in other workmen from the same cause and of the same age. Hand in hand with the increase of acute lung diseases there is a decrease in the age at death from tuberculosis. This means that the fatal course of tuberculosis in smoky districts is shorter.

3. Animal experiments show that the inhaling of smoke increases the susceptibility of animals to infection by aspergillus. Pneumonia develops in animals which have inhaled smoke more easily than in the control animals.

Ascher's experimental work can scarcely be used as a comparison with the influence of the smoky atmosphere of cities, because he used the smoke or soot of burning petroleum, which forms an insignificant amount of the smoke content of cities and differs very materially from the main content of the smoke of city air.

So far as Ascher's statistical tables are concerned, there can be very little doubt that acute lung diseases are taking a different course to tuberculosis, and one of the most appalling things of modern civilization has been the sharp increase of the mortality rate from acute diseases of the respiratory tract coincident with industrial activity and the consequent provocation by smoke of the respiratory tract, this being in sharp contrast to the diminution of the chronic diseases of the respiratory tract, as exemplified by tuberculosis.

The pneumonia death toll for 1900 for the United States was 105,971; for 1909, 122,400; and for 1910, 136,000; an increase of 10 per cent in one year.

The average death rate from tuberculosis per 100,000 for the 10-year period 1900–1909 was 183; in 1909 it was 160.8; and in 1910, 160.3. This shows a steady decrease.

These figures are examples of the merit which this subject has for our most earnest study.

The chief fact which has stimulated our interest in the pneumonia problem in the city of Pittsburgh has been the terribly acute and fatal type of pneumonia which fills the wards of our hospitals. It can hardly be that this severity of infection has to do alone with the virulence of the germ; nor does it seem likely that it has to do with the generally low type of resistance which Pittsburghers have to this type of infection; rather, it seems more likely that there must be some factor present in Pittsburgh which does not operate in other cities. As we approached this subject we felt sure that we would be able to prove that this factor was the smoke of the iron and steel mills. How signally we have failed in this will be very evident from chart 4, in which is seen the striking contrast between Boston, with almost no smoke, and Pittsburgh, swamped with smoke, yet with approximately the same pneumonia death rate. The same sort of thing is apparent between Mobile, Ala., with almost no smoke, and St. Louis, Mo., with a very high smoke content in its air.

When we attempt to analyze the city of Pittsburgh on the basis of air content of smoke and pneumonia death rate, so striking is the correspondence between the pneumonia death rate and the smoke content of the air of the ward that we are convinced that smoke is a very important factor in the severity of the disease and that some other factor must operate in those cities where the smoke content of the air is not the determining factor in the pneumonia death rate. This correspondence is more striking even when we put in a line showing that there is no definite bearing of such other factors as poverty, race, and congestion. When, however, one turns to tuberculosis and analyzes the death rate from this disease by wards and charts it up in comparison with the smoke content of the air, one finds that there is comparatively no association whatever. This corresponds with our clinical observations on between four and five thousand cases of tuberculosis in the last six years. As the result of this clinical study we have come to the conclusion that the general death rate from tuberculosis in Pittsburgh is low—that there is nothing in the smoke content of the air which in any way stimulates the onset of the tubercular process or militates against the rapidity of recovery from tuberculosis when once this disease has been contracted.

In other words, after having made an analytical study of the relation of smoke in the city of Pittsburgh, where it is possible, by virtue of its contour, to separate the atmosphere into "densely laden," "moderately laden," and "comparatively no smoke" areas, and in

such a way as to rule out such influences as poverty, race, and congestion, we are forced to the conclusion that the smoke content of the air has an apparently important bearing on the pneumonia death rate and comparatively little bearing on the tuberculosis death rate.

From the careful analytical studies of the character of the smoke in the city of Pittsburg, carried out by Dr. Klotz and Dr. Holman in connection with this same work, there is added a purely chemical and physical reason for this same conclusion, for they have found that the percentage of phenol around the carbon, which pollutes the air, is sufficient to destroy most or many of the organisms with which they have studied when suspensions of these are mixed with suspensions of air smoke.

With this fact in mind it is probably legitimate for one to turn to the pathological studies of these two infections. Pneumonia is a catarrhal condition, and a predisposition for it may be prepared by the irritation of the mucous membranes with foreign substances; but the second (tuberculosis), being granulomatous in type, in which the microorganisms are sequestered and surrounded by cells, the cure of which is accomplished by fibrosis, may naturally be supposed to be aided in the direction of cure by any deposit which stimulates granulation and fibrosis. Some strength is given to this theoretical view by the evidence which we have from anatomical studies, in which we find depositions of carbon particles around the healed tuberculous focus.

One can not help wondering why, when the facts concerning these two diseases are known, so little has been done on the question of pneumonia prevention, when so much has been accomplished on the tuberculosis side of pulmonary infection; and, in addition to my remarks upon the relation of smoke to this disease, I should like to again call attention to certain suggestions which I offered a year ago in an address before the Ontario Medical Association for the control of a certain portion of the evils arising from pneumonia. These are as follows:

First. The proper segregation of pneumonia patients and their utensils in hospitals; cleaning, by sprays and washes, of the noses and throats of all who nurse and come in contact with these patients; careful hand washing of nurses and attendants after handling; careful destruction of sputum and other discharges; sterilization of linen of patients; fumigation of rooms after occupancy; and the use of gauze, which can be burned, instead of handkerchiefs. These will be the center of the educational crusade.

Second. To have attached to our dispensaries certain nurses who have received special instruction on nursing and preventing the spread of pneumonia, these to be sent to all pneumonia cases in home-nursing work.

Third. The reporting of all such cases to the health department governing the district where the disease exists and the fumigation of the quarters in which the disease has occurred by the department after the death or recovery of the patient.

Fourth. The instruction of the public by pamphlets and school lectures on the necessity for keeping the noses and throats cleansed, especially during winter months; the necessity for controlling the dust of streets by better sprinkling and night sweeping; the evils of bad ventilation in house, public building, and school; of alcohol; of badly cooked, poor food; of lack of rest; of worry; of the handkerchiefs; of the bearing on pneumonia of spitting, as well as on other diseases; of the increased resistance generated by open-air sleeping; and similar knowledge. This, I am sure, can best be engrafted on the child's mind rather than on that of the adult.

A PSYCHOSIS FOLLOWING CARBON-MONOXIDE POISONING, WITH COMPLETE RECOVERY.

Dr. Mary O'Malley, senior assistant physician, Government Hospital for the Insane, Washington, D. C.

Among the various toxic psychoses which have come under my observation in the Government Hospital for the Insane, one which was produced by carbon-monoxide poisoning is of special interest, in view of the fact that the patient suffered from a severe intoxication which resulted in the development of mental symptoms one month following the accident and terminated in a complete recovery. That psychic disorder is one of the sequelæ of this form of poisoning has long been recognized, yet few cases have been recorded in this country. A careful review of the literature yields scanty information as to the clinical and pathological course of this toxemia, notwithstanding the many accidents which occur in our large cities and collieries. However, some valuable observations on this subject can be obtained from foreign publications.

Cases of carbon-monoxide poisoning may be accidental, suicidal, or homicidal, or the latter two may be combined. In France, four-fifths of the suicides are caused by poisoning with carbon-monoxide gas. In the large cities of this country, scarcely a day passes without a number of cases of accidental or suicidal intoxication from this gas being reported in the newspapers, and still there are no available statistics of these accidents or fatalities. In the last bulletin of the United States Census Bureau on "Mortality Statistics" deaths from this source are not grouped independently, but are included under the general head of "Mortality from intoxications."

This gas may be produced in houses by defective combustion in the various forms of heating apparatus, particularly in movable stoves, charcoal braziers, or slow-combustion stoves. Since carbureted water gas has been used as an admixture to illuminating gas the danger to life by defective gas fittings and gas stoves, as well as from the mains in the soil, has increase, and accidental deaths and suicides have multiplied enormously, according to Gleister, of Glasgow. Another source of danger from this gas has arisen in

recent years from the extensive use of benzine and gasoline explosive engines which are installed in the motor car, motor boat, and aeroplane. Investigations following accidental death from the gas escaping from such engines revealed the fact that the men attending the engines in the cabins of launches often have toxic symptoms—headache, dizziness, and so forth. In this connection it is the opinion of Surg. Gen. Stokes, of the United States Navy, that the noxious gases generated by exploded powder in the turrets, from burning coal in the firerooms, and other causes are similar to carbon monoxide in illuminating gas, and are responsible for the collapse and sometimes the death of men working on warships, phenomena heretofore ascribed to the effects of intense heat.

Carbon monoxide is a constituent of mine air, when explosions occur, and of the gas of blast furnaces. This form of poisoning may occur in many other occupations, and it is therefore a matter of importance in industrial pathology. In view of the above facts, it is surprising that more frequent cases of nervous and mental disorders following this intoxication have not been recorded in America, where so many fatal mine explosions occur and so many deaths result from illuminating gas. Many of the States have recently appointed commissions to investigate occupational diseases, among which was included this form of poisoning. In 1909 these commissions united as a permanent organization, known as the National Conference upon Compensation for Industrial Accidents.

The Bureau of Commerce and Labor issued a bulletin in 1910 on "Fatal Accidents in Coal Mines." This report furnishes no information concerning the effects of such intoxication upon those who escaped death. A revised list of industrial poisonings has recently been published in German by the International Association for Labor Legislation, and its translation in full is given in a bulletin published by the Department of Commerce and Labor in May, 1912. Included in this publication is an interesting summary on carbon monoxide, the designation of the substance, the branches of industry in which the poisoning occurs, the mode of entrance into the body, and symptoms of the poisoning.

Ziehn mentions a chronic monoxide poisoning which affects those employed in laundries as ironers, firemen, and others who work in crowded overheated places in which there are bad heating arrangements, and in which these people are obliged to remain for some considerable time. It manifests itself in general nutritional disturbances, and presents a picture of mental and bodily fatigue which is sometimes regarded as either neurasthenia or hysteria.

The following is the clinical record of the case:

Case 18888, M. A. O., admitted December 10, 1910; native of Ireland; single; age, 45 years; indigent.

The following history was supplied by an aunt of the patient, with whom she made her home. After the patient's return to her normal mental state she corroborated this information:

Family history: Negative, so far as could be learned, as to nervous or mental diseases, epilepsy, etc.; mother died of tuberculosis at the age of 30 years.

Personal history: Born in Ireland; was elder of two children; always healthy; common-school education. After her mother's death, kept house for her father until she came to this country, at the age of 28 years. Upon her arrival in this country she obtained employment as a domestic, and was evidently an efficient servant, as she was employed for a number of years by prominent families in this city, among whom was a United States Senator and a German ambassador. She was of a cheerful disposition, habits good, and always attended to her religious duties. Was fond of reading history, fiction, and periodicals. On November 2, 1909, she went to bed in her usual good health, and on the following morning was found in a deep coma. Upon investigation, it was found that illuminating gas was escaping from a defective gas fixture in the room which she occupied for the first time upon her return from her vacation, not knowing that the stopcock was broken, though this fact was known by the other servants in the house. Had it not been for an open window, the accident would have been fatal. She was at once removed to the George Washington University Hospital, where she remained in an unconscious condition for four days. The informant called on her four days after the occurrence, but at this time was unable to arouse her. However, on the sixth day the patient recognized her, although she was dull of comprehension and appeared somewhat somnolent. From this time on patient daily improved, and was discharged on November 13, 1910, having recovered from the acute effects of the poisoning.

Abstract of record from the George Washington University Hospital, where she was first taken immediately after the accident: Admitted to the George Washington University Hospital on November 3, 1910. For the first 24 hours patient's temperature fluctuated between 101 and 100; pulse between 120 and 82; respirations, 40 and 22. Was given oxygen on admission, and normal salt solutions frequently, at least every four hours; hot applications externally. Patient began to perspire about three hours after admission. She was given oxygen every hour for a short time. Hypodermoclysis of 500 cc. was given.

Summary at end of first day: Nurses' notes—Was catherterized. Patient perspired a great deal. Hot bottles, oxygen every hour for 15 minutes during the last 18 hours. Patient turned on her side for a half hour during the night.

Summary at end of second day: Maximum temperature 101; minimum, 98.6; pulse, 100 to 80; respirations, 30 to 24. Oxygen given every hour for 15 minutes. Hot applications, normal salt injections. Nurses' observations: Patient restless all night; seemed more rational.

Summary at end of third day: Maximum temperature, 100; minimum, 99; pulse, 100 to 70; respiration, 30 to 24. Oxygen given. Saline solution discontinued. Patient conscious at intervals; slept very little; complained of pain in back; very restless all night; slept at intervals.

Summary at end of fourth day: Temperature, normal; pulse, 78 to 70; respirations, 26 to 24. Patient restless all night, complaining of pain in back and neck; slept about one hour. Patient tossed about the bed; got out of bed.

Summary at end of fifth day: Maximum temperature, 98.8 to 97.8; pulse, 80 to 78; respirations, 28 to 24. Patient very quiet during the day; restless all night; complained of pain in back; asked to get out of bed. Slept from 1 o'clock on at intervals.

Summary at end of sixth day: Temperature, normal; pulse, 80 to 74; respirations, 24. Patient very restless all night; complains of pain in the back; wanted to get out of bed. Slept about three hours.

Summary at end of seventh day: Temperature, normal; pulse, 80 to 74; respirations, 24 to 22. Patient very restless all night; slept about four hours during the night; very nervous. Given regular diet; eats well. Voided urine.

Summary at end of eighth day: Temperature, normal; pulse, 78 to 76; respirations, 24 to 22. Patient very restless; slept about four hourse during the night; very nervous. Given regular diet; eats well. Voided urine. Patient sat up in chair during the day.

Summary at end of ninth day: Temperature, normal; pulse, 80; respirations, 24. Patient up during the day; walked about; slept well.

November 13, 1910, tenth day, discharged.

Upon her return to her aunt's home she continued to improve, and after two weeks was allowed to go back to the place where she had been working, as relatives and friends at this time considered her well. Soon after she resumed her duties the servants with whom she was associated noticed that she was becoming dull and forgetful about her work. She gradually became worse and, on this account, at the end of a week she was taken back to the home of her aunt, where she remained until her admission to this hospital.

While at her home, one week later, her aunt observed that her actions were peculiar, her movements were very awkward, and her memory seemed to be a complete blank. She had outbursts of laughter without provocation; did a great many irrational acts—for instance, one day she was noticed trying to put the trousers of a little boy on for a waist. She put her hands through the legs, and tried to pull the trousers over her head. She was unable to find her way about the house. One day she wandered from her aunt's house to the United States Treasury Building, where she accosted a policeman, and told him that she was in search of the house on U Street where she was formerly employed. She was directed to the residence and found her way there safely. A few hours afterwards she was again taken back to her aunt's home. At this time she was oriented to person and place, but could not tell the hour, day, month, or year. Was unable to attend to her personal wants, became very untidy, would not remain in bed, and finally passed into a state of confusion and was brought to this hospital December 10, 1910, 38 days after trauma.

On admission to this hospital, December 10, 1910, the patient was in a semistuporous condition; would answer questions promptly; was able to give her name, but all other replies were incorrect and irrational. She extended her tongue when told to do so, but otherwise was unable to carry out the simplest orders given her; was spoon fed, as she was unable to feed herself. Throughout examination patient showed causeless laughter.

Physical examination: Patient was in bed; well-nourished white woman, height 5 feet 2½ inches, weight 120 pounds; masklike facial expression; hair dark brown, mixed with gray, fine in texture; slight lateral scoliosis; deformity of sternum at articulation of the gladiolus with the manubrium; ears small; right antihelix more prominent than the left; feet calloused, metatarsal phalangeal articulations prominent; complexion sallow, superfluous hair on face; skin free from eruptions; mucous membranes moist and pale; tongue coated, eroded on tip, gums inflamed, marked pyorrhea alveolaris, breath foul; appetite poor; bowels regular; heart normal in outline, slight presystolic murmur over apex; protruded tongue showed slight tremor; pupils equal, reacted promptly to light and accommodation; knee jerks exaggerated, right greater than the left; plantars diminished; anesthesias over the whole surface of the body, including

the face: she showed no reaction to deep pin pricks, although this may have been due to some extent to the mental dullness. She could not recognize heat or cold when applied to the surface of the body, nor was she able to distinguish the gustatory tests used—salt, sour, sweet, or bitter; called a solution of quinine, when placed on her tongue, sour; unable to recognize any of the olfactory tests; said peppermint was bitter; cloves, didn't know; called stench hartshorn; astereognosis present; grip, right hand 14 kgs., left hand 9½ kgs.; coarse tremor of extended hands; gait unsteady and uncertain; balancing power impaired; involuntary evacuations of the bladder and bowels; urinalysis negative, no sugar, albumin, or casts.

Wassermann reaction, with the blood serum and the cerebrospinal fluid, negative. Cerebrospinal fluid, clear; protein content not increased; Noguchi test, negative. Cell count 1 per cmm. Differential; lymphocytes 98; large mononuclears 2.

The notes made for the next three days showed that mentally the patient was dull and apathetic; responded promptly to all questions, but was able to give little additional information in regard to personal matters; gave name of the country in which she was born, but could not give the name of the county or parish. Her replies were irrelevant, and accompanied by outbursts of laughter. This tendency to laughter was also shown when she heard the voices of anyone around her, or whenever anyone approached the bed. She had a mistaken identity of all persons in her environment, although she recognized her aunt on her visits. She appeared mentally clearer, in so far as she was able to comprehend and carry out simple orders given, although there was a retardation and some incoordination in all her movements. When asked where she was, she said she was at home, but that she had just been down the river on a boat with President Taft and his daughter Helen. At this time she carried out the following orders after considerable hesitation: Right forefinger on left ear; right hand on left knee; left hand on right knee.

The neurological symptoms above mentioned still continued; deep reflexes all exaggerated. At this time there was present on both sides a wrist clonus, also a slight Babinski; anesthesias were still present, but there was an area on the inner side of the right thigh just above the knee about the size of a silver dollar which showed a delayed reaction to pin pricks.

The following is an abstract of the clinical notes for the next 10 days, from December 15 to 25:

Consciousness still clouded. She gave prompt replies to all questions, but still showed a tendency to confabulate; on one occasion she said she had just returned from the Bureau of Engraving and Printing; that she was employed there, and again that she had been at her home.

As a rule, all replies were incorrect. Said she was born in Ireland, but, when asked in what county, said, first, County Limerick and then County Mayo, when in fact she was born in County Clare. Still had a mistaken identity of persons, and showed uncontrollable laughter. Whenever she heard anyone speaking near her, she laughed heartily without cause. She continued to have incontinence of urine and feces. At this time she was able to comprehend and carry out simple orders as follows: Right forefinger on left ear; right heel on left knee; left heel on right knee; all movements were unsteady and ataxic. Rhomberg present; gait unsteady; marked Babinski. All deep reflexes were still exaggerated; there was marked clonus of both wrists and ankles on both sides. Anesthesias were not so marked; she was able to recognize deep pin pricks on almost all parts of the body, but could not localize light pin pricks.

During the next five days the patient showed some improvement. She had learned the names of two physicians, the head nurse, and two noisy patients in the ward, but was unable to identify them. She was disoriented to place and time. She was at this time able to give the names of one or two of her employers, the name of the church she attended in the city, the correct county and parish in Ireland in which she was born, and gave correctly the names of her relatives in this city and in Ireland. Falsification of memory continued. Said she was at the Y. M. C. A., and had just returned from the city.

The deep reflexes continued exaggerated; ankle clonus and wrist clonus present, also Babinski; anesthesias were not as prominent as formerly; patient responded to light pin pricks on face, hands, and inner sides of her legs and thighs.

During the next five days, from December 30 to January 5, patient continued to improve, especially on the physical side. She appeared to be able to comprehend all instructions given her, but her movements showed inhibition, and it was only with much effort on her part that she was able to cooperate. When told to put her right forefinger on her left ear, she put her right forefinger on the right ear. When asked if that was correct, she said, "No, you said my left ear." She then placed her left forefinger on her left ear. When asked to extend her right hand, she extended her left hand. When told to extend her right and left foot, she did so correctly. After five minutes these orders were again repeated, and this time she failed on all. She still showed some impairment of the stereognostic sense; she recognized a number of objects placed in her hands, but failed in several others. The physical examination at this time showed sordes of the teeth and tongue, and mild gingivitis. Patient was hyperalgesic to pin pricks of the face and ears, the nipples, sacral region, and soles of the feet. After much experimenting, she recognized light touches of cotton wisps. Thermic sense appeared normal over the entire body; gustatory sense normal. Olfactory: Said camphor was smelling salt; stench, pleasant. Equality of grip, 10 kg. each. Reflexes: Triceps and radials and ulnars markedly exaggerated; knee kick exaggerated with slight clonus; plantar and tendo Achilles present; no defense reaction from the feet; jaw jerk present; abdominal absent; Babinski on both sides; slight Romberg present; gait ataxic; tongue, eyelids on closure, and extended hands show tremor; tongue deviated to the right side. Five days later patient was up and dressed; was able to feed herself and had control of her sphincters; said she was living in the Capitol Building; that she had been living here five years; said she was not insane, but had a weakened mind from taking gas.

For the next 10 days, up to January 20, patient improved both physically and mentally; showed orientation, but was unable to recall any of the occurrences in her life for the past two months; assisted with work about the wards. She could recall all the principal events of her own life up to the time of the accident, but showed an anterograde amnesia for subsequent occurrences.

From this time on the patient improved rapidly; had insight and reacted normally to her environment. A mental examination at this time, about February 1, showed that she had recovered her mental faculties, but there was an anterograde amnesia covering a period of three months.

As she was in poor physical health, she was retained in the hospital until April 7, when she was discharged as recovered. The physical examination on that date showed the following results: Patient recognizes pin pricks and light touches all over the body; thermic and stereognostic senses normal; olfactory and gustatory senses normal; no Romberg present; no Babinski; pupils respond sluggishly to light and accommodation; sympathetic scarcely visible; right and left triceps very active and exaggerated; radial and ulnar present; right

knee kick exaggerated; tendo Achilles diminished; plantar reflexes very slight; no defense reaction. Patient did very well in performing the above tests. She was willing to cooperate; her reactions were inhibited.

If one seeks in the literature analogous cases of physical disturbances from carbon-monoxide poisoning, very few will be found, and the information given is meager. What strikes the attention most forcibly, when the cases are compared, is that almost every case has its own stamp, and each one presents a clinical picture different from the others. Le Deseeu [1] has collected a number of cases in which the following mental disturbances followed: Aphasia, acute delirium, transitory chronic delirium, mental confusion, amnesia, melancholia, and dementia. And on the physical side he found muscular paralyses of diverse types: Hemiplegias, paraplegias, and monoplegias, various tropic disorders, convulsions, and so forth.

The mental condition of this patient, on first observation, was one of deep confusion. She answered questions readily, as one in advanced stages of senility is apt to do. All answers were accompanied by silly laughter, and none were correct. However, the examination of the patient during the first few days showed that there was a lack of power of attention and concentration which prevented intelligent conversation, and made her replies unreliable and incorrect, and the product of her own imagination.

The principal manifestation of psychic disturbance in these cases is a loss of memory. The amnesia produced by oxide of carbon poisoning is generally sudden in its appearance, and not slow and progressive, like traumatic or alcoholic amnesia; it is a characteristic symptom appearing suddenly, extinguishing at once the entire past, and reducing to almost nothing the perception of the present surroundings. It may be the only apparent symptom in a mild case of poisoning and may soon disappear, or it may be accompanied with disturbances of attention. The amnesia may simulate Korsakow's syndrome in the polyneuritic psychosis with confabulation, pseudo-reminiscences, and so forth. A defective memory may exist in a certain number of cases which recover. This amnesia is retrograde or anterograde in type; it is variable in course and intensity; in some cases it is transitory, lasting often only a few hours or days; in others, it persists for months or years; or it may be continuous, and, again, it may require the use of memory exercises to produce any results. In this patient it lasted nearly three months, blotting out this period from her life. More than one month elapsed from the time of the accident until the mental symptoms developed, or, at least, were recognized, and the patient was admitted to this hospital. We are unable to determine from information received how much her memory was affected after the acute effects of the poisoning had run its course. If there was a defect present at that time, it was not apparent to her

friends and relatives with whom she came into daily contact. When she gradually began to regain consciousness in this hospital, she had a complete retrograde amnesia which included her past life. After several weeks, the retrograde amnesia gradually disappeared, and she then showed anterograde amnesia only; that is, for the time of the accident, and subsequent thereto. The patient was able to recall the details of her life the day before the accident, but she could not recall any of the events occurring from the time she fell asleep in her surroundings on the evening of November 2, until the middle of the month of February, when under treatment in this hospital. After her recovery, the total period of amnesia was three months.

Sachs,[2] who has compiled a treatise concerning these complications, says:

"In the early stage of convalescence a total amnesia is especially typical, either extending over the time before the poisoning, i. e., retrograde, or to the things of the present, i. e., anterograde."

The falsifications of memory which were noted in our case during the first month are suggestive of Korsakow's syndrome. These were present to a very marked degree. Stierlin mentions this symptom in two of his patients. In the reports of these cases, one finds the various forms of amnesia diversely associated. Le Desseur cites Brouardel's case of a physician who, following an incomplete intoxication, lost his memory totally. Arriving at his patient's house, he forgot her name, and the course of the illness in her case. This amnesia lasted 18 months, at the end of which time he fully recovered. In his study Le Dessuer also mentions a lithographer who was amnesic to such a degree that he was obliged to consult an indicating board in order to recall the colors that should be applied to each part of the plate. M. Bricard reports a case of a very decided retrograde amnesia. A woman of 21 years of age attempted suicide. The amnesia was complete in all that related to her attempted suicide. She knew of it because she was told of it, but doubted it very much. As to events immediately preceding the attempted suicide, there was found amnesia for at least one week.

Many writers call attention to a marked aphasia in this intoxication, although sometimes it is mentioned as a simple trouble of speech in the form of an embarrassment or of stuttering. This apparently is not a true aphasia, but may rather be designated an amnesic aphasia, since, with the disappearance of the amnesia, the aphasia becomes less marked, or disappears altogether.

Sometimes, in coming out of the coma, there appears an acute transitory delirium which may last a few hours, accompanied by an excitement in which the patient is euphoric to a degree. This delirium is rarely accompanied by hallucinations, but in chronic intoxications the delirium is more prolonged and is accompanied by various

hallucinatory disturbances which may be accompanied by delusions of persecution. In the acute stage, this patient showed no delirious experiences of any description although according to Sachs, these delirious conditions belong to the first stages of the poisoning.

Kraepelin[3] states that when those affected first awake from the sleep of the poisoning, in some cases there is an interval free from any disturbance, which lasts many days, or weeks, and then suddenly or gradually the severe symptoms of the disease manifest themselves. Some cases have been followed by relapses. In this connection Weidner[4] says:

"It is not possible to separate in a sharp manner the after phenomena from the acute symptoms, for in most cases the source of the same extends back to the actue stages, with the exception of a few phenomena of special brain affections, which appear after a free interval, or become manifest after such an interval; and, secondly, the boundary between the disturbances which must be ascribed to the acute poisoning and those which are to be understood as after phenomena are so labile that up to the present there appears to be no unity of opinion concerning them."

The case under discussion showed such reaction to the effects of the intoxication, for after the actue symptoms had subsided, she was about her usual duties for at least 10 days or 2 weeks before the mental symptoms became evident. Abrahamson[5] gives a similar case in which a patient of his was comatose for two days following an acute intoxication from illuminating gas, after which time her intelligence returned, and she went home. Two weeks later she developed a psychosis.

A marked reduction in the emotional field in these cases has been observed by many writers. Recently Pfeifer has called attention to a singular phenomenon which often attracts attention in poisoning from coal gas, and that is the fixed, masklike expression of the face. The emotional tone of this patient for nearly two months was one of indifference. There were abrupt outbursts of an irresistible tendency to laughter. These outbreaks were spasmodic in character and occurred without provocation. All her replies were accompanied by this causeless laughter; it was evident whenever anyone approached her bed. This emotion was not deep, as she laughed when a patient in the adjoining bed was weeping. In the intervals between these attacks of laughter her face was apathetic. This appears to be a common symptom in carbon-monoxide poisoning and has been referred to by several observers. Some of these cases show changeable humors, for they rapidly changed from despondency to laughter. Stierlin,[6] in his study on this subject, mentions this lack of emotion. One of his patients evinced this symptom, showing a lack of proper feeling toward his sweetheart, to whom he was engaged before the accident and expected to marry shortly. To some extent this may be explained from the characteristic autopsy results which have been

reported in a series of cases where the symmetrical centers of softening were in or about the vicinity of the optic thalmus—most frequently in the globus pallidus and the lenticular nucleus—and hence in those sections of the brain which are supposed to control mimicry.

A subnormal temperature is characteristic of the first stages of the poisoning, after which it rises rapidly, attaining the maximum in the first 12 hours. No record of a subnormal temperature in this case was made. The first temperature, 101° F., was the maximum recorded on the first day following the trauma. On the four subsequent days it fluctuated between this and normal, and from then remained stationary. Ravine[7] cites a case of a high temperature being reported in a child 8 years old which reached 110° F. in 8 hours, accompanied by a pulse rate of 115 per minute. The pulse rate of this patient was in relative proportion to the temperature.

On the physical side we found involuntary evacuation of the bowels and bladder, exaggerated tendon reflexes with clonus, including the Babinski reflex. Disturbances of sensation were also noted, including anasthesias, hyperalgesias, and so forth. The involuntary evacuation of the bowels and bladder existed for about one month in this hospital, and a few days prior to that. This was probably due to the mental confusion and not to the loss of spinal-cord control, for after the confusion disappeared she recovered this control. It is difficult to state whether the neurological disturbances were due to central or peripheral changes in the nervous system. However, the disturbances of sensation, including anasthesias, et cetera, were probably due to the neuritis which always accompanies intoxications of this class.

Opinions differ on the subject with regard to the action of carbon monoxide on the human economy. Haldane has shown by experiments that all symptoms, immediate and secondary, can be referred to the want of oxygen, and that they vary according to the degree of saturation of hemoglobin with the carbon monoxide gas. He states that "with 20 per cent saturation the only symptom is a slight tendency to dizziness and shortness of breath on exertion. As the saturation increases, however, the symptom of want of oxygen becomes more and more pronounced, until at 50 per cent saturation it is scarcely possible to stand, and even slight exertion causes temporary loss of consciousness." In the fatal cases 80 per cent of the hemoglobin is saturated with carbon monoxide. However, Le Desseur sums up his conclusions as follows:

> That in cases of survival oxycarbon intoxication frequently leaves after it a series of complications bearing principally on the nervous system. The paralysis comes from cerebral and medullar lesions, or is due to the polyneuritis, or two other causes may come into play, namely, traumatism and hysteria. The mental troubles are sometimes connected with material alterations in the brain, such as hemorrhages, thromboses, or softenings. Sometimes they are com-

pletely independent. In all these cases the simple anoxhemia—that is, the affinity of the oxide of carbon gas for the hemaglobin of the red corpuscles—is insufficient for explaining all the manifestations. Hysteria itself, though possible in certain cases, is unable to explain the phenomena observed. That experiments would tend to prove that carbon monoxide is dissolved in the serum and has a direct specific localized effect on the nerve cell.

Mott[8] is of the opinion that all the nervous symptoms can be explained by the thrombotic occlusions and hemorrhages which occur as the result of carbon-monoxide poisoning. These hemorrhagic conditions are more noticeable in the white matter of the brain, but this can be explained by the anatomical construction of the blood vessels supplying these parts.

Unfortunately, all observations of the course of such carbon-monoxide psychoses over a period of years is entirely wanting. Sachs, in the preparation of his treatise on this subject, was impressed by this fact and states that "It would be interesting to know the further course of such cases." It is only in a mild uncomplicated case of this sort that we can make any regular comparisons. The majority of these cases prove fatal, and where this not the case the mental symptoms vary from dementia to complete recovery. There are many factors to be considered in the course and prognosis of this disease, namely, the general make-up and predisposition of the patient, the degree of poisoning, and in mine accidents we have to consider, in addition to the intoxication, the emotional stress, the overexertions and deprivations from lack of food, and the exposure accompanying the trauma. Stierlin in his work gives a full report of observations made by himself and others among 21 survivors in the mine catastrophe at Carrieres, on March 10, 1906, which claimed 1,100 victims. These observations are of importance from the fact that they were continued over a period of two and a half years in the natural environments of the patients, where they showed their psychopathological conditions in the eccentricities of their lives, and in their personal relations toward their families and friends. None of these patients made a complete recovery, although some of them were able to earn a living. The chronic effects of the intoxication, however, remained, as was shown by the neurological changes, as well as in the various forms of dementia present. He classified the mental phenomena into four groups, as follows, although none of them could be considered an entity, as each class encroached upon the other: (1) Psychoses caused by carbon-monoxide intoxication; (2) psychoneuroses caused by carbon-monoxide intoxication; (3) emotion psychoses; (4) traumatic neuroses of mixed etiology.

Mott affirms that "considering the effect of carbon-monoxide poisoning being followed by mania, melancholia, confusion, and other mental symptoms, it must not be lost sight of that many cases, to begin with, are suicidal, and therefore if not actually insane at

the time, probably possess an insane or neuropathic temperament." This case was a pure and simple intoxication, uncomplicated by any other neurological factor. There was no inherited predisposition, nor was there present any deviation from the normal in the mental state previous to the trauma. The woman gave no evidence of emotional instability, had an even temperament, and was intelligent for one of her class. I am satisfied, from the history given by her aunt, and by one of the servants who had been her friend for a number of years, that the idea of suicide did not enter into her case. She was in an unusually happy mood previous to the poisoning, and, besides this, she was a devout Christian, and always faithful in the performance of her religious duties. While the active mental symptoms abated in March, she was not discharged until one month later, as her physical health was rather poor. Two months afterwards she sailed to her brother's home in Ireland, where she has remained ever since. Inquiries made from her aunt show that the patient has written regularly to her relatives in this country, and that there is no evidence from the content of her letters that she has undergone any change since she left. However, the aunt states that she expects the patient to return to this country within a few months, and she will then have the patient visit the writer.

---

[1] Des Troubles Intellectuals consecutifs à l'Intoxication oxycarbonique, Thèse de Paris, par Louis Le Desseur.

[2] Die Kohlenoxyd-Vergiftung in ihrer klinischen, hygienischen und gerichtsärztlichen Bedeutung, von Dr. Med. Willy Sachs, 1900.

[3] Kraepelin: Psychiatry, 8th edition, 1910.

[4] Ueber die Schädigungen des Nervensystems nach Vergiftung mit Kohlenoxyd. Hermann Weidner, Leipzig, 1910.

[5] Ner. & Mental, 1905, XXXII, 332, Abrahamson.

[6] Üeber psycho-neuropathische Folgezustände bei den Ueberlebenden der Katastrophe von Caurriéres am 10 Marz, 1906. Eduard Stierlin, Basel, 1909.

[7] Ravine: The Successful Treatment of a Case of Illuminating Gas Poisoning; Jour. of the A. M. A., June, 1911.

[8] Carbon Monoxide and Nickel Carbonyl Poisoning. F. W. Mott, M. D., F. R. S. Archives of Neurology, London, 1907.

The proceedings of the Joint Session of Sections IV and IX are found in Volume I, Part II.

INDEX.

VOLUME III: SECTIONS III AND IV.

Page.

Accidents par électrocution (Paul Weiss) 730
Acute effects of caisson disease (Seward Erdman) 619
Adolescence:
  Physical efficiency tests during (J. H. McCurdy) 420
  The effects of monotonous toil in the years preceding (Margaret McMillan). 985
Age (physiological), the significance of, in education (C. Ward Crampton) 224
Ahrens (Minnie H.) 150
Altersprobleme gewerblicher Hygiene (Ludwig Teleky) 957
American Museum of Safety, the (William H. Tolman) 860
Andrews (John B.): Legal protection for workers in dangerous trades in the United States 836
Anthrax in Liverpool, the incidence of (industrial) (Edward W. Hope) 735
Anthropological study of children, remarks on the (Franz Boas) 413
Arbeiterwohlfahrt in Charlottenburg; Die ständige Ausstellung für (Konrad Hartmann) 870
Ashford (Bailey K.): The economic aspects of hookworm disease in Porto Rico. 742
  Discussion 764
Ausstellung für Arbeiterwohlfahrt in Charlottenburg, Die ständige (Konrad Hartmann) 870
Babbitt (Ellen C.): Prenatal work in certain American cities 304
Babies, city, and infants, hygiene of (Adolf Baginsky) 69
Baby-saving show, held in Philadelphia in May, 1912, discussion of the (Samuel McC. Hamill) 90
Baginsky (Adolf):
  Hygiene of city infants and babies 69
  Kinderkrankheiten während des Schullebens 195
Baker (S. Josephine): The reduction of infant mortality in New York City 139
Barker (Lewellys F.): The scope of the work of the National Committee for Mental Hygiene 468
Barnes (Earl): The education of partly paralyzed muscles 378
Bassoe (Peter): The late manifestations of compressed-air disease 626
Bauzá (Julio A.): Mortalidad infantil en la Republica del Uruguay en el decenio 1901–1910 431
Bekämpfung der ansteckenden Kinderkrankheiten, Die (Walther Ewald) 152
Bell (Stoughton): Existing legal provisions with regard to the suppression of unnecessary noises 536
Benner (Raymond C.): How and why smoke is injurious 1015
Berufskrankheiten u. Unglücksfälle der Minen- und Tunnelarbeiter (Wilhelm Lindemann) 673
Beschäftigungsneurosen, Die (L. von Frankl-Hochwart) 543
Blake (Clarence John): The suppression of unnecessary noise 533
Boas (Franz): Remarks on the anthropological study of children 413
Bogue (Edward A.) 373

Page.
Brannan (John W.): The prophylactic and therapeutic value of fresh air in schools and hospitals, including heliotherapy 406
Brass poisoning (occupational); brass founder's ague (Emery R. Hayhurst) 764
Brown (Elias G.): Sex instruction and hygiene of boyhood 55
Bureau of Labor (U. S.), the relation of, to industrial hygiene (Charles H. Verrill) 914
Burgerstein (Leo): Results to individuals from medical inspection 245
Discussion 37
Burnham (William H.): Mental hygiene in the school 209
Cabot (Arthur T.): The management of tuberculosis among school children 189
Caissonarbeit, Die Gefahren der (Philipp Silberstern) 610
Caisson disease:
The late manifestations of compressed-air disease (Peter Bassoe) 626
The acute effects of (Seward Erdman) 619
An unsuspected cause of (T. Kennard Thomson) 608
Caisson disease and its prevention (Henry Japp) 639
Carbon monoxide poisoning, with complete recovery; a psychosis following (Mary O'Malley) 1027
Carozzi (Prof. L.):
Results of a hygienic and sanitary inquiry into the Italian printing trade .. 857
Hygienic and sanitary inquiry in silk mills 859
Casamajor (Louis): An unusual form of mineral poisoning affecting the nervous system. Manganese? 574
Discussion 581
Causes, evils, and remedy for tenement-house manufacturing (A. S. Daniels) .. 1011
Chancellor (William E.): The relation of teacher and pupil, with special reference to the education of immigrants and of their children in American public schools 237
Discussion 135, 271
Child hygiene, instruction in (Mary S. Macy) 10
Child labor in the United States (Owen R. Lovejoy) 1001
Child welfare; the need of community planning (Wilbur C. Phillips) 290
Children, the labor and work of, should be adapted to the individual child (Thomas Morgan Rotch) 975
City infants and babies, hygiene of (Adolf Baginsky) 69
Clark (L. Pierce): Notes on the prevention of epilepsy 477
Cohn (Konrad): The preservation of the teeth in schools in Germany, and the work of the German Central Committee for Dental Hygiene 343
Coit (Henry L.): The public school as a possible factor in preventing infant and child mortality 286
Commons (John R.): Government study of occupational diseases 928
Community planning in child-welfare work, the need of (Wilbur C. Phillips) .. 290
Compressed-air disease, the late manifestations of (Peter Bassoe) 626
Conservation of the child (Charles G. Kerley) 298
Considerations regarding the factor of fatigue with reference to industrial conditions (William A. White) 526
Crampton (C. Ward): The significance of physiological age in education 224
Discussion 37, 48
Crankshaw (Charles W.) 604, 857
Cronin (John J.): Disinfection of nose and posterior nares 45
Cunningham (Russell M.) 690
Dangerous trades in the United States, legal protection for workers in (John B. Andrews) 836

Page.
Daniels (Annie S.): The causes, evils, and remedy for tenement-house manufacturing 1011
Davies (Edgar T.) 828, 933
Dental hygiene:
The work of the German Central Committee for Dental Hygiene (Konrad Cohn) 343
The human mouth in its relation to disease (W. G. Ebersole) 359
For the pupils of public schools (S. A. Knopf) 350
The hygiene of children's teeth (W. H. Potter) 365
Diseases and accidents of miners and tunnel workers in the United States (Jos. A. Holmes) 691
Diseases and injuries occurring in electric generating plants (J. D. McGowan) .. 710
Disinfection of nose and posterior nares (John J. Cronin) 45
Disinfection of schools, the routine (J. T. Ainslie Walker) 131
Duffield (Francis) 150
Easton (Ernest D) 849
Ebersole (Wm G.): The human mouth in its relation to disease 359
L'école de l'avenir (A. Augustin Rey) 103
Economic aspects of hookworm disease in Porto Rico (Bailey K. Ashford) 742
Economic aspects of hookworm disease in the United States (C. Wardell Stiles) . 757
Education of partly paralyzed muscles (Earl Barnes) 378
Effects of exposure to intense heat on the working organism (Charles N. Fiske) .. 655
Effects of industrial strain on the working woman (R. S. Morton) 933
Effects of temperature and humidity on fatigue (Fred. S. Lee) 504
Effects of monotonous toil in the years preceding adolescence (Margaret McMillan) 985
Eisenarbeiter; Die Unfälle und Erkrankungen der (Friedr. Röpke) 712
Electric generating plants, diseases and injuries occurring in (J. D. McGowan) .. 710
Electricity, injuries caused by (Sir Thomas Oliver) 703
Electrocution, accidents par (Paul Weiss) 730
Epilepsy, notes on the prevention of (L. Pierce Clark) 477
Erdman (Seward): The acute effects of caisson disease 619
Erkrankungen der Eisenarbeiter, Die Unfälle und (Friederich Röpke) 712
Esthesiometric method, measuring fatigue; in the light of the logarithmic method of M. Améline (M. C. Schuyten) 429
Everhard (Eleanora S.) 484
Ewald (Walther): Die Bekämpfung der ansteckenden Kinderkrankheiten 152
Examination of employees for tuberculosis (Theodore B. Sachs) 849
Examination of workers, occupational diseases and the physical (George M. Price) 844
Existing legal provisions with regard to the suppression of unnecessary noises (S. Bell) 536
Eye strain and occupational disease (George M. Gould) 582
Fabrikgesetz, Ueber Japanisches (Tadahiro Noda) 907
Factory labor:
Infant mortality in relation to (George Reid) 943
Infant mortality in relation to (John Robertson) 947
Fall River, Mass., infant mortality in relation to the employment of mothers (C. H. Verrill) 318
Fatigue, the effects of temperature and humidity on (Fred. S. Lee) 504
Fatigue factors in certain types of occupations (Shepherd I. Franz) 512
Fatigue, the study of, and its application to industrial workers (Josephine Goldmark) 517

Page.
Fatigue, with reference to industrial conditions, some considerations regarding the factor of (William A. White) 526
Feeble-mindedness, the prevention of (Henry H. Goddard) 463
Field work in tuberculosis (Mary E. Lapham) 338
Fiske (Charles N.): The effects of exposure to intense heat on the working organism 655
Flatau (Theodor S.): Stimmhygiene, ihre Bedeutung und ihre Organisation in Preussen (Deutschland) 541
Folks (Homer): The foundling 86
Follow-up system in medical inspection (Thomas A. Storey) 268
Foundling, the (Homer Folks) 86
Frankel (Lee K.): Industrial insurance the basis of industrial hygiene 890
Frankl-Hochwart (Ludwig von): Die Beschäftigungsneurosen 543
Franz (Shepherd I.): Fatigue factors in certain types of occupations 512
Fresh air in schools and hospitals, including heliotherapy, the therapeutic and prophylactic value of (John W. Brannan) 406
Fundamentals of the hygiene of the teacher, some (Grace N. Kimball) 38
Gefahren der Caissonarbeit, Die (Philipp Silberstern) 610
Gefahren in dem Gebrauche des Quecksilbers in der Industrie (Karl Heucke) .. 788
Glibert (D. J.): L'hydrargyrisme dans les couperies de poils 800
Goddard (Henry H.): The prevention of feeble-mindedness 463
Goldmark (Josephine): The study of fatigue and its application to industrial workers 517
Gonorrhea in children by direct infection, on the occurrence of syphilis and (Abraham L. Wolbarst) 49
Gould (George M.): Eye strain and occupational disease 582
Government study of occupational diseases (J. R. Commons) 928
Greene (H. Copley) 604
Grinker (Julius) 605, 654
Groszmann (Maximilian P. E.) 37, 245, 469, 485
Hall (Pearl M.) 103
Hamill (Samuel McC.): Discussion of the baby-saving show, held in Philadelphia, May, 1912 90
Hamilton (Alice): Lead poisoning in the United States 809
Hanson (William C.):
The hygiene of occupation and its administrative control 899
Resolutions introduced by 496
Harrington (Thomas F.): Resolutions introduced by 7
Discussion 136, 150
Hart (Hastings H.) 86
Hartmann (Konrad): Die ständige Ausstellung fur Arbeiterwohlfahrt in Charlottenburg. (Anstalt des deutschen Reichs) 870
Harvey (H. McK.) 581
Hayhurst (Emery R.): Occupational brass poisoning, brass founder's ague 764
Heat (intense), the effects of exposure to, on the working organism (Charles N. Fiske) 655
Hedger (Caroline): The school children of the stockyards district 170
Heliotherapy, and the prophylactic and therapeutic value of fresh air in schools and hospitals (John W. Brannan) 406
Henderson (Charles R.): State commissions on occupational diseases 920
Heucke (Karl): Die Gefahren in dem Gebrauche des Quecksilbers in der Industrie 788
Holmes (George J.) 151, 272

Page.
Holmes (Joseph A.): Diseases and accidents of miners and tunnel workers in the United States 691
Hoobler (B. Raymond): The effect of humidity, temperature, air movement, and barometric pressure on the blood pressure, pulse, and respiration of children under the influence of various forms of ventilation 116
Hookworm disease in Porto Rico, the economic aspects of (Bailey K. Ashford). 742
Hookworm disease in the United States, the economic aspects of (C. Wardell Stiles) 757
Hope (Edward W.): The incidence of industrial anthrax in Liverpool 735
How and why smoke is injurious (R. C. Benner) 1015
Humidity, temperature, air movement, and barometric pressure on the blood pressure, pulse, and respiration of children under the influence of various forms of ventilation; the effect of (B. Raymond Hoobler) 116
Humidity and temperature, the effects of, on fatigue (Fred. S. Lee) 504
Hurty (John N.) 136
Hydrargyrisme dans les couperies de poils (D. J. Glibert) 800
Hygiene of children's teeth (William H. Potter) 365
Hygiene of occupations, The (George M. Kober) 499
Hygiene of occupation; Altersprobleme gewerblicher Hygiene (Ludwig Teleky) 957
Hygiene of occupation and its administrative control (William C. Hanson) 899
Hygienic and sanitary inquiry in silk mills (L. Carozzi) 859
Immigrants and their children, the relation of teacher and pupil with reference to the education of (William E. Chancellor) 237
Industrial hygiene, the relation of the United States Bureau of Labor to (Charles H. Verrill) 914
Industrial insurance the basis of industrial hygiene (Lee K. Frankel) 890
Industrial lead poisoning in the United States (Alice Hamilton) 809
Industrial lead poisoning and some of the problems it raises (Sir Thomas Oliver) 821
Industral mercurial poisoning in felt-hat makers (Frank E. Tylecote) 778
Industrial plumbism (Francis D. Patterson) 827
Industrial strain, effects of, on the working woman (R. S. Morton) 933
Industrial workers, the study of fatigue and its application to (Josephine Goldmark) 517
Industry, the sanitary control of an, by the industry itself (Lillian Wald) 881
Infant mortality:
The reduction of, in New York City (S. Josephine Baker) 139
Training of midwives in relation to the prevention of (Clara D. Noyes) 382
And its relation to the employment of mothers in Fall River, Mass. (Charles H. Verrill) 318
Infant mortality in relation to factory labor (George Reid) 943
Infant mortality in relation to factory labor (John Robertson) 947
Infant and child mortality, the public school as a possible factor in preventing (Henry L. Coit) 286
Infants, city, and babies, hygiene of (Adolf Baginsky) 69
Infant-welfare movement in England, phases in the development of the (Janet Lane-Claypon) 388
Instruction in child hygiene (Mary S. Macy) 10
Insurance (industrial) the basis of industrial hygiene (Lee K. Frankel) 890
Ironworkers; Die Unfälle und Erkrankungen der Eisenarbeiter (Friederich Röpke) 712
Japanisches Fabrikgesetz, Ueber (Tadahiro Noda) 907

Page.
Japp (Henry): Caisson disease and its prevention 639
Kerley (Charles G.): The conservation of the child 298
Kimball (Grace N.): Some fundamentals of the hygiene of the teacher 38
Kinderkrankheiten, Die Bëkampfung der ansteckenden (Walther Ewald) 152
Kinderkrankheiten während des Schullebens (Adolf Baginsky) 195
Knight (Boyd W.) 136
Knopf (S. Adolphus):
Open-air schools and open-air breathing exercises in schools and colleges to prevent tuberculosis and other diseases 22
Dental hygiene for the pupils of public schools 350
Kober (George M.): The hygiene of occupations. (Introductory address) 499
Koon (Thomas M.) 103
Labor and work of children should be adapted to the individual child (T. M. Rotch) 975
Lane-Claypon (Janet): Phases in the development of the infant welfare movement in England 388
Lapham (Mary E.): Field work in tuberculosis 338
Lead poisoning in the United States (Alice Hamilton) 809
Lead poisoning (industrial), and some of the problems it raises (Sir Thomas Oliver) 821
Lead poisoning (industrial) (Francis D. Patterson) 827
Lee (Frederic S.): The effects of temperature and humidity on fatigue 504
Legal protection for workers in dangerous trades in the United States (John B. Andrews) 836
Lindemann (Wilhelm): Ueber die Unglücksfälle und Berufskrankheiten der Minen- und Tunnelarbeiter 673
Linenthal (Harry): The prevention of occupational diseases 900
Liverpool, the incidence of industrial anthrax in (E. W. Hope) 735
Logarithmic method of Dr. Améline; the esthesiometric method; measuring fatigue in the light of the (M. C. Schuyten) 429
Lovejoy (Owen R.): Child labor in the United States 1001
McCurdy (James H.): Physical efficiency tests during adolescence 420
McGowan (John D.): Diseases and injuries occurring in electric generating plants 710
McMillan (Margaret): The effects of monotonous toil in the years preceding adolescence 985
Discussion 849
Mac Murchy (Helen): What medical inspection of schools can do for the teacher. 265
Macy (Mary Sutton): Instruction in child hygiene 10
Manganese? An unusual form of mineral poisoning affecting the nervous system (Louis Casamajor) 574
Maternity, municipal supervision of (S. W. Newmayer) 396
Mayer (Fred J.) 375
Medical inspection, results to individuals from (Leo Burgerstein) 245
Medical inspection of schools:
A follow-up system in (Thomas A. Storey) 268
What, can do for the teacher (Helen Mac Murchy) 265
Some important aspects of, a schoolman's view (Willard S. Small) 255
Mental deficiency (and physical inability), the relation of, to the body social. (Isabelle T. Smart) 216
Mental hygiene, subsection on 459
Mental hygiene in the school (William H. Burnham) 209

Page.
Mental Hygiene, the scope of the work of the National Committee for (Lewellys F. Barker) ... 468
Mercurial poisoning in felt-hat makers (Frank E. Tylecote) ... 778
Mercurial poisoning, hydrargyrisme dans les couperies de poils (D. J. Glibert). 800
Mercury, Die Gefahren in dem Gebrauche des Quecksilbers in der Industrie (Karl Heucke) ... 788
Midwives, training of, in relation to the prevention of infant mortality (Clara D. Noyes) ... 382
Miner (Maude E.) ... 470, 484
Mineral poisoning, an unusual form of (manganese?) affecting the nervous system (L. Casamajor) ... 574
Miners and tunnel workers in the United States, diseases and accidents of (Joseph A. Holmes) ... 691
Miners and tunnel workers: Ueber die Unglücksfälle und Berufskrankheiten der Minen- und Tunnelarbeiter (Wilhelm Lindemann) ... 673
Monotonous toil, the effects of, in the years preceding adolescence (Margaret McMillan) ... 985
Mortalidad infantil en la Republica del Uruguay en el decenio 1901–1910 (Julio A. Bauzá) ... 431
Morton (Rosalie Slaughter): Effects of industrial strain on the working woman.. 933
Mothers, in Fall River, Mass., infant mortality and its relation to the employment of (Charles H. Verrill) ... 318
Mouth, the human, in its relation to public health (W. G. Ebersole) ... 359
Municipal supervision of maternity (S. W. Newmayer) ... 396
Museum of Safety, The American (W. H. Tolman) ... 860
National Committee for Mental Hygiene, the scope of the work of the (Lewellys F. Barker) ... 468
Neuroses:
  Die Beschäftigungsneurosen (L. von Frankl-Hochwart) ... 543
  What occupation neuroses really are (T. A. Williams) ... 566
Newmayer (Solomon W.): Municipal supervision of maternity ... 396
Noda (Tadahiro): Ueber Japanisches Fabrikgesetz ... 907
Noise:
  Existing legal provisions with regard to the suppression of unnecessary noise (Stoughton Bell) ... 536
  The suppression of unnecessary noise (Clarence John Blake) ... 533
Nose and posterior nares, disinfection of (John J. Cronin) ... 45
Notes on the prevention of epilepsy (L. Pierce Clark) ... 477
Noyes (Clara D.): Training of midwives in relation to the prevention of infant mortality ... 382
Nursery maids, St. Margaret's House, Albany, an institution for the care of babies and the training of (H. L. K. Shaw) ... 80
Occupational diseases:
  Government study of (John R. Commons) ... 928
  Die Beschäftigungsneurosen (L. von Frankl-Hochwart) ... 543
  L'hydrargyrisme dans les couperies de poils (D. J. Glibert) ... 800
  Eye strain and (George M. Gould) ... 582
  Lead poisoning in the United States (Alice Hamilton) ... 809
  Brass poisoning; brass founder's ague (Emery R. Hayhurst) ... 764
  State commissions on (Charles R. Henderson) ... 920
  Die Gefahren in dem Gebrauche des Quecksilbers in der Industrie (Karl Heucke) ... 788

Occupational diseases—Continued. Page.
Diseases and accidents of miners and tunnel workers in the United States (Jos. A. Holmes) ... 691
Ueber die Unglücksfälle u. Berufskrankheiten der Minen- und Tunnelarbeiter (Wilhelm Lindemann) ... 673
Prevention of (H. Linenthal) ... 900
Diseases and injuries occurring in electric generating plants (J. D. McGowan) ... 710
Lead poisoning (industrial) and some of the problems it raises (Sir Thomas Oliver) ... 821
Industrial plumbism (Francis D. Patterson) ... 827
The physical examination of workers (George M. Price) ... 844
Die Unfälle u. Erkrankungen der Eisenarbeiter (F. Röpke) ... 712
In New York (W. Gilman Thompson) ... 829
Industrial mercurial poisoning in felt-hat makers (Frank E. Tylecote) ... 778
What occupation neuroses really are (Tom A. Williams) ... 566
Occupations:
Fatigue factors in certain types of (S. I. Franz) ... 512
Hygiene of (Geo. M. Kober) ... 499
Hygiene of, and their administrative control (Wm. C. Hanson) ... 899
Oliver (Sir Thomas):
Industrial lead poisoning, and some of the problems it raises ... 821
Injuries caused by electricity ... 703
Discussion ... 580
Resolutions introduced by ... 496
O'Malley (Mary): A psychosis following carbon-monoxide poisoning, with complete recovery ... 1027
Open-air schools and open-air breathing exercises in schools and colleges to prevent tuberculosis and other diseases (S. Adolphus Knopf) ... 22
Ophthalmology, a new therapeutic agent in (C. G. Precerutti) ... 605
Paralyzed muscles, the education of (Earl Barnes) ... 378
Parents' cooperation in promotion of child hygiene (Mrs. Frederic Schoff) ... 294
Patterson (Francis D.): Industrial lead poisoning ... 827
Philadelphia, the baby-saving show held in, in May, 1912 (Samuel McC. Hamill) ... 90
Phillips (Wilbur C.): The need of community planning in child-welfare work ... 290
Physical efficiency tests during adolescence (J. H. McCurdy) ... 420
Physical examination of workers, and the occupational diseases (George M. Price) ... 844
Physical inability and mental deficiency, relation of, to the body social (Isabelle T. Smart) ... 216
Potter (William H.): The hygiene of children's teeth ... 365
Precerutti (C. G.): A new therapeutic agent in ophthalmology ... 605
Prenatal work in certain American cities (Ellen C. Babbitt) ... 304
Preservation of the teeth in schools in Germany: The work of the German Central Committee for Dental Hygiene (Konrad Cohn) ... 343
Prevention of caisson disease (Henry Japp) ... 639
Prevention of epilepsy, notes on the (L. P. Clark) ... 477
Prevention of feeble-mindedness (Henry H. Goddard) ... 463
Prevention of occupational diseases (H. Linenthal) ... 900
Price (George M.): Occupational diseases and the physical examination of workers ... 844
Discussion ... 849
Printing trade, Italian, results of an inquiry into the (Prof. L. Carozzi) ... 857

Page.
Prophylactic and therapeutic value of fresh air in schools and hospitals, including heliotherapy (John W. Brannan) ... 406
Psychosis following carbon-monoxide poisoning, with complete recovery, a (Mary O'Malley) ... 1027
Public schools, a plan for the teaching of hygiene in (Ira S. Wile) ... 17
Public school as a possible factor in preventing infant and child mortality (Henry L. Coit) ... 286
Pulligny (M. J. de) ... 581
Putnam (James J.) ... 540
Putnam (Mrs. Wm. Lowell) ... 405
Quecksilbers, Die Gefahren in dem Gebrauche des, in der Industrie (Karl Heucke) ... 788
Rauh (Sidney J.) ... 373
Reduction of infant mortality in New York City (S. Josephine Baker) ... 139
Reid (George): Infant mortality in relation to factory labor ... 943
Relation of physical inability and mental deficiency to the body social (Isabelle T. Smart) ... 216
Relation of the U. S. Bureau of Labor to industrial hygiene (C. H. Verrill) ... 914
Resolutions introduced by—
Dr. William C. Hanson ... 496
Dr. Thomas F. Harrington ... 7
Sir Thomas Oliver ... 496
Results of a hygienic and sanitary inquiry into the Italian printing trade (L. Carozzi) ... 857
Rey (A. Augustin): L'école de l'avenir ... 103
Robertson (John): Infant mortality in relation to factory labor ... 947
Röpke (Friederich): Die Unfälle und Erkrankungen der Eisenarbeiter ... 712
Rose (Wickliffe) ... 761
Rotch (Thomas Morgan): The labor and work of children should be adapted to the individual child ... 975
Royster (Lawrence T.) ... 86, 151
Rubinow (Isaac M.) ... 896
Sachs (Theodore B.): Examination of employees for tuberculosis ... 849
Safety, the American Museum of (W. H. Tolman) ... 860
Sanitary control of an industry by the industry itself (Lillian D. Wald) ... 881
Schoff (Mrs. Frederic): Parents' cooperation in promotion of child hygiene ... 294
School children of the stockyards district (Caroline Hedger) ... 170
School children, the management of tuberculosis among (Arthur T. Cabot) ... 189
Schools:
Some important aspects of efficient medical inspection of (W. S. Small) ... 255
A follow-up system in medical inspection of (Thomas A. Storey) ... 268
Routine disinfection of (J. T. Ainslie Walker) ... 131
Schulärztin an den höheren Mädchenschulen; eine sozial-hygienische Forderung (Helene F. Stelzner) ... 273
Schuyten (M. C.): The esthesiometric method, measuring fatigue, in the light of the logarithmic method of Dr. Améline ... 429
Scope of the work of the National Committee for Mental Hygiene (Lewellys F. Barker) ... 468
Seelig (Leopold) ... 487
Sex instruction and hygiene of boyhood (Elias G. Brown) ... 55
Shaw (Henry L. K.): St. Margaret's House, Albany, an institution for the care of babies and training of nursery maids ... 80
Discussion ... 86

Page.
Significance of physiological age in education, the (C. Ward Crampton)..... 224
Silberstern (Philipp): Die Gefahren der Caissonarbeit..... 610
Silk mills, results of a hygienic and sanitary inquiry in Italian (Prof. L. Carozzi). 859
Small (Willard S.): Some important aspects of efficient medical inspection of schools; a school man's view..... 255
Smart (Isabelle T.): Studies in the relation of physical inability and mental deficiency to the body social..... 216
Smith (Claude A.)..... 763
Smoke; how and why smoke is injurious (R. C. Benner)..... 1015
Smoke; a study of the influence of varying densities of city smoke on the mortality from pneumonia and tuberculosis (William Charles White)..... 1020
State commissions on occupational diseases (C. R. Henderson)..... 920
Stelzner (Helene F.): Die Schulärztin an den höheren Mädchenschulen: Eine sozial-hygienische Forderung..... 273
Stiles (C. Wardell): The economic aspects of hookworm disease in the United States..... 757
Stimmhygiene, ihre Bedeutung und ihre Organisation in Preussen (Deutschland) (Th. S. Flatau)..... 541
Stockyards district, the school children of the (Caroline Hedger)..... 170
Storey (Thomas A.): A follow-up system in medical inspection..... 268
St. Margaret's House, Albany, an institution for the care of babies and the training of nursery maids (Henry L. K. Shaw)..... 80
Study of fatigue and its application to industrial workers (J. Goldmark)..... 517
Study of the influence of varying densities of city smoke on the mortality from pneumonia and tuberculosis (W. C. White)..... 1020
Subsection on mental hygiene..... 459
Suppression of unnecessary noise (C. J. Blake)..... 533
Syphilis and gonorrhea, the occurrence of, in children, by direct infection (A. L. Wolbarst)..... 49
Teacher:
Some fundamentals of the hygiene of the (Grace N. Kimball)..... 38
What medical inspection of schools can do for the (Helen MacMurchy)..... 265
Teacher and pupil, the relation of, with respect to the education of immigrants and of their children in American public schools (William E. Chancellor). 237
Teeth:
The hygiene of children's (William H. Potter)..... 365
The preservation of the, in German schools, and the work of the German Central Committee for Dental Hygiene (Konrad Cohn)..... 343
Teleky (Ludwig): Altersprobleme gewerblicher Hygiene..... 957
Temperature, humidity, air movement, and barometric pressure on the blood pressure, pulse, and respiration of children under the influence of various forms of ventilation, the effect of (B. Raymond Hoobler)..... 116
Temperature and humidity, the effects of, on fatigue (Fred. S. Lee)..... 504
Tenement-house manufacturing, the causes, evils, and remedy for (Annie S. Daniels)..... 1011
Therapeutic agent, a new, in opthalmology (C. G. Precerutti)..... 605
Thompson (W. Gilman): Occupational diseases in New York..... 829
Thomson (T. Kennard): An unsuspected cause of caisson disease..... 608
Tolman (William H.): The American Museum of Safety..... 860
Totman (David M.)..... 103
Training of nursery maids, St. Margaret's House, Albany, an institution for the care of babies and the (H. L. K. Shaw)..... 80

Tuberculosis:
Management of, among school children (A. T. Cabot) ... 189
Field work in (Mary E. Lapham) ... 338
Examination of employees for (Theodore B. Sachs) ... 849
Tuberculosis and other diseases, open-air schools and open-air breathing exercises in schools and colleges to prevent (S. Adolphus Knopf) ... 22
Tunnelarbeiter, Ueber die Unglücksfälle und Berufskrankheiten der Minen- und (Wilhelm Lindemann) ... 673
Tylecote (Frank E.): Industrial mercurial poisoning in felt-hat makers ... 778
Ueber Japanisches Fabrikgesetz (T. Noda) ... 907
Ueber die Unglücksfälle u. Berufskrankheiten der Minen- und Tunnelarbeiter (Wilhelm Lindemann) ... 673
Uncinariasis:
The economic aspects of, in Porto Rico (B. K. Ashford) ... 742
The economic aspects of, in the United States (C. W. Stiles) ... 757
Unfälle und Erkrankungen der Eisenarbeiter (Fr. Röpke) ... 712
Unglücksfälle und Berufskrankheiten der Minen- und Tunnelarbeiter (Wilhelm Lindemann) ... 673
Uruguay, Mortalidad infantil en la Republica del, en el decenio 1901–1910 (Julio A. Bauzà) ... 431
Van Wagenen (Bleecker) ... 470
Ventilation, the effect of humidity, temperature, air movement, and barometric pressure on the blood pressure, pulse, and respiration of children, under various forms of (B. Raymond Hoobler) ... 116
Verrill (Charles H.):
Infant mortality and its relation to the employment of mothers, in Fall River, Mass ... 318
The relation of the United States Bureau of Labor to industrial hygiene ... 914
Wald (Lillian D.): Sanitary control of an industry by the industry itself ... 881
Walker (J. T. Ainslie): The routine disinfection of schools ... 131
Discussion ... 137
Wallin (J. E. Wallace) ... 486
Warner (Frank) ... 22
Way (Howell) ... 137
Weiss (Paul): Accidents par électrocution ... 730
What occupation neuroses really are (Tom A. Williams) ... 566
White (William A.): Some considerations regarding the factor of fatigue, with reference to industrial conditions ... 526
White (William Charles): A study of the influence of varying densities of city smoke on the mortality from pneumonia and tuberculosis ... 1020
Wile (Ira S.): A plan for teaching hygiene in the public schools ... 17
Discussion ... 152
Williams (Tom A.): What occupation neuroses really are ... 566
Wolbarst (Abraham L.): On the occurrence of syphilis and gonorrhea in children by direct infection ... 49
Work and labor of children should be adapted to the individual child (T. M. Rotch) ... 975
Workers in dangerous trades, legal protection for, in the United States (J. B. Andrews) ... 836
Working woman, effects of industrial strain on the (Rosalie S. Morton) ... 933

3 2044 062 596 234

3 2044 062 596 234